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GLENHAROLD TRACT

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FORT UNION COAL REGION

GLENHAROLD TRACT ANALYSIS

SITE SPECIFIC ANALYSIS

OLIVER and MERCER COUNTIES, NORTH DAKOTA

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September 1981

Michael J. Penfold
State Director

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INTRODUCTION

The purpose of this action is to consider for leasing 42.7 million tons of federal coal needed to support the production of an existing mine.

This site-specific environmental analysis has been prepared for the Glenharold tract (Map 1) in accordance with federal regulations (43 CFR 3420). It will be used by the Fort Union Regional Coal Team to further consider competitive leasing of federal coal within the tract for a June 30, 1983 coal lease sale schedule. If selected and scheduled, the Glenharold tract will make available for leasing 42.7 million tons of recoverable federal coal.

The effects of mining all coal (federal and nonfederal) in the tract are not addressed in this document. Only the effects of mining an area north of a line two sections south of the Mercer/Oliver county line are described. The reasons for this approach are as follows:

1) A power plant just off the tract receives its coal from the Glenharold Mine on the tract.

2) The Consolidation Coal Company has 2,229 acres of federal coal under lease in the tract.

3) Consol has numerous mining permits in the area.

4) The Bureau of Land Management (BLM) prepared an environmental assessment for a 1,600 acre short term lease application in 1979. This assessment detailed the impacts of coal mining on the north half of what is now the Glenharold tract.

BACKGROUND

In September of 1980, the Dickinson District BLM Office adopted the West-Central North Dakota Management Framework Plan (MFP) for Oliver, Mercer, McLean, Stark, and Dunn counties, and a small part of Billings County. The land use planning process included identification of high or moderate potential coal areas, application of unsuitability criteria, identification of resource trade-offs, and consultation with surface owners. As a result of that work, areas were identified that could be further considered for coal development. These areas are available for consideration of new competitive leasing, lease exchanges, and lease modifications.

Following land-use planning, the BLM requested expressions of interest from industry. These expressions, along with other information, guided the U.S. Geological Survey (USGS) in delineating this tract. Results of that work are summarized in this document.

The BLM Dickinson District staff inventoried the tract to determine the site-specific resource values and then analyzed potential environmental effects of coal development on this tract. Among other things certain of the unsuitability criteria were further considered. Any new findings are reflected in this report.

Information from this and other site-specific analyses will be used by the Regional Coal Team during the tract ranking and selection process for a lease sale schedule. The proposed tracts will be cumulatively analyzed in a regional environmental impact statement. Among the alternatives addressed will be different combinations of tracts that meet a regional coal leasing target.

After reviewing the analytical documents, public comments, and the recommendations of the regional coal team, the Secretary of the Interior will select specific tracts for the lease sale. The successful lessee will be required to submit a plan for mining and reclamation to the Office of Surface Mining (OSM) for review and approval within three years after leasing. In evaluating the plan, OSM will prepare a site-specific environmental assessment or EIS.

Tracts in the Fort Union Region are being considered in accordance with the federal coal management program adopted by the Secretary of the Interior in June 1979. The basis of the program was, in part, the final environmental statement for the Federal Coal Management Program. Implementation procedures are contained in Federal Regulations (43 CFR 3400). Authorizing actions are the Mineral Leasing Act of 1920, as amended; the Mineral Leasing Act for Acquired Lands of 1947, as amended; the Federal Land Policy and Management Act of 1976; the Surface Mining Control and Reclamation Act of 1977; the Multiple Mineral Development Act of 1954; the Department of Energy Organization Act of 1977; the National Environmental Policy Act of 1969; the Federal Coal Leasing Amendments Act of 1976, as amended; and federal regulations concerning federal coal leasing and development, including 43 CFR 3400, 30 CFR 211, and 30 CFR 700-899.

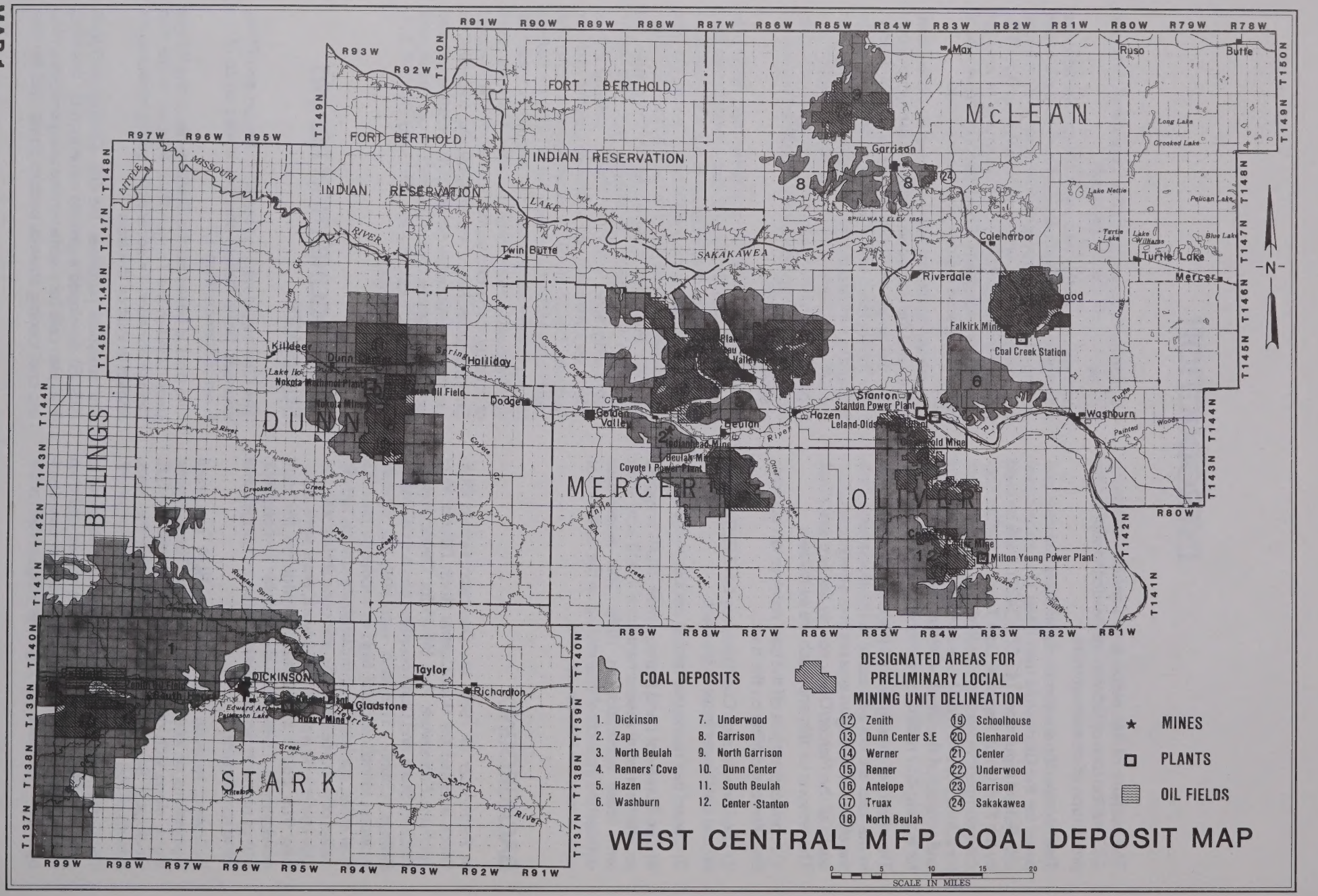
TRACT DELINEATION REPORT SUMMARY

The Glenharold tract is located in Mercer and Oliver counties, North Dakota about two miles south of the town of Stanton (Map 1).

The tract is based on the Stanton, Berg, and Yeager beds found in the Tongue River Member of the Fort Union Formation (Paleocene). No geologic hazards are known to exist on this tract.

For analytical purposes, the U.S. Geological Survey (USGS) developed a generic mine plan for this tract. This plan calls for a surface mine using draglines, electric coal loading shovels, bottom dump coal haulers,

MAP 1



WEST CENTRAL MFP COAL DEPOSIT MAP

rotary drills, bulldozers, scrapers, and other support equipment. A possible mining sequence is shown on Map 2. The coal would be mined to a depth of 200 feet or until the limiting stripping ratio of 20:1 has been reached. The most probable end-use of the coal would be the Leland Olds power plant.

Specific Tract Characteristics:

Acreage:

Surface:	Federal Leased	0
	Federal Unleased	0
	State	40
	Private	19,636
	Total:	19,676
Coal:	Federal Leased	2,229
	Federal Unleased	3,612
	State	1,680
	Private	12,155
	Total	19,676

Coal Reserves/Millions of Tons:

In Place:	Federal Leased	27.6
	Federal Unleased	47.4
	State	7.0
	Private	139.0
	Total	211.00
Recoverable:	Federal Leased	24.8
	Federal Unleased	42.7
	State	6.3
	Private	125.1
	Total:	198.9

Bypassed Federal Coal: 779 acres;
Recoverable Reserves: 10.1 million tons

Coal Quality: Average of samples as received from vicinity of tract:

Moisture	36.4%
Volatile matter	28.7%
Fixed carbon	29.7%
Ash	5.0%
Sulfur	0.6%
BTU's/lb	6,788

Surface Disturbance/acres

Mining: Annual rate, 247; Total Life of Mine, 12,833

Haul Roads: 248

Mine Facilities: Already built

Stripping Ratio: Less than or equal to 20:1

Coal Thickness: Stanton Bed, 5 to 16 feet; Berg Bed, 5 to 8 feet; Yeager Bed, 5 to 7 feet

Mine Employment: Permanent employees at peak production would number about 160

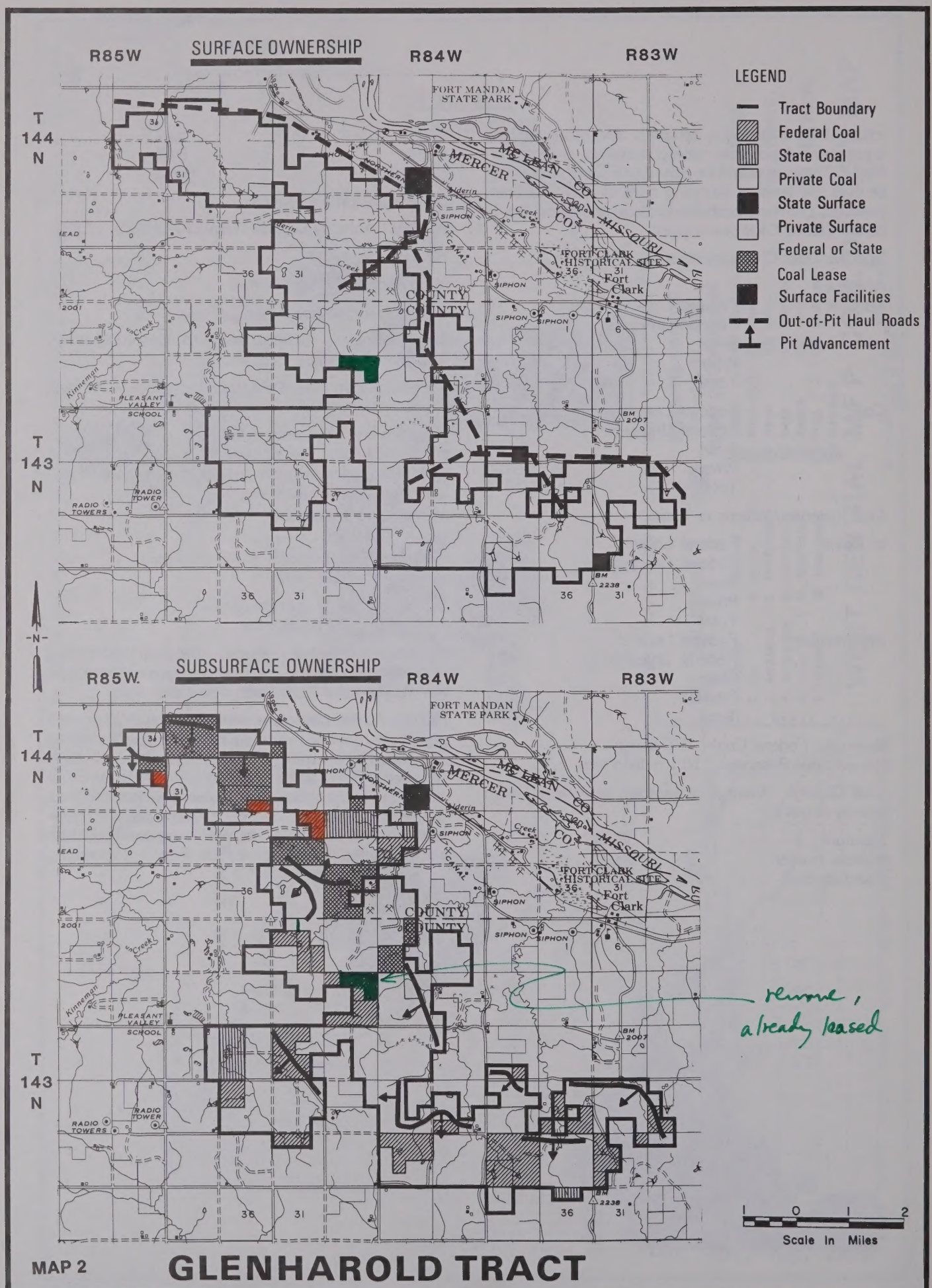
Royalties and Severance Taxes:
Annual Federal Royalty, unleased coal, $0.36 million
Annual Federal Royalty, leased coal, $0.61 million
Annual North Dakota Royalty, $0.09 million
Annual North Dakota Severance Tax, $3.4 million

Water Needs:
Human Consumption, 5,000 gal./day
Source: Well water

Nonpotable, 35,000 gal./day
Source: Pit dewatering

For more specific information on the proposed mining operation, refer to the engineering, geologic, and land reports prepared by the tract delineation team.

NOTE: As the mine plans developed by USGS are of a generic nature and the actual mining sequence will be developed by the mining companies to fit their individual needs, the resource specialist assigned to the SSAs made the assumption that all lands within the tract boundaries would be disturbed to some degree. Therefore, acreage in the SSA may not always agree with that shown in the Tract Delineation Report concerning acreage disturbance.


SURFACE OWNERSHIP
R85W
R84W
R83W
T 144 N
T 143 N
FORT MANDAN STATE PARK
MERCER CO
MCLEAN CO
MISSOURI
FORT CLARK HISTORICAL SITE
Fort Clark
SIPHON
CANAL
COUNTY
PLEASANT VALLEY SCHOOL
RADIO TOWERS
BM 2007
BM 2238
LEGEND
Tract Boundary
Federal Coal
State Coal
Private Coal
State Surface
Private Surface
Federal or State Coal Lease
Surface Facilities
Out-of-Pit Haul Roads
Pit Advancement
-N-
SUBSURFACE OWNERSHIP
R85W.
R84W
R83W
remove, already leased
0 1 2
Scale In Miles
MAP 2
GLENHAROLD TRACT

CHAPTER I
ALTERNATIVES

LEASING AND DEVELOPMENT

The alternative is to offer for further consideration 42.7 million tons of unleased federal coal in the Glenharold tract for competitive leasing. This tract has been identified, as a logical mining unit for a 3.8 million ton per year surface mine having a 52 year mine life. The Glenharold tract has been delineated within areas designated as acceptable for further consideration in the West-Central North Dakota Management Framework Plan (MFP) adopted in Septebmer 1980. The tract does not include any lands for which the surface owner has filed a valid refusal to consent (to mining) prior to March 1, 1981. The tract has been fully cleared of unsuitability criteria numbers 1, 2, 4, 5, 6, 8, 10, 11, 12, 13, 16, 17, 18, 19, and 20 as defined in 43 CFR 3461. Criteria 7, 9, 14, and 15 require further study. With the exception of criteria, 3, all unsuitability criteria studies will be completed and fully applied before work begins on the final regional environmental impact statement, if not, this tract will be dropped from further consideration. Criteria 3 will be deferred until mining and reclamation plans are submitted to the Office of Surface Mining and North Dakota Public Service Commission for final approval. Current unsuitability concerns are shown on Map 3. The following is a list of unsuitability criteria.

(1) Federal Land System
(2) Rights-of-Way and Easements
(3) Buffer Zones along R/W and Adjacent to Communities and Buildings
(4) Wilderness Study Areas
(5) Scenic Areas
(6) Lands Used for Scientific Studies
(7) Historic Lands and Sites
(8) Natural Areas
(9) Federally Listed Endangered Species
(10) State Listed Endangered Species
(11) Bald and Golden Eagle Nests
(12) Bald and Golden Eagle Roost and Concentration Areas
(13) Falcon Cliff Nesting Sites
(14) Migratory Birds
(15) State Resident Fish and Wildlife
(16) Floodplains
(17) Municipal Watersheds
(18) National Resource Waters
(19) Alluvial Valley Floors
(20) State Proposed Criteria

Relationship to Other Developments

Two power plants, the Stanton and Leland Olds plants are located just off this tract. The nearest active mines are Knife River's Beulah Mine 18 miles west and North American's Indianhead Mine, 24 miles to the west, and Glenharold Mine on the tract. Farming and ranching are the only other significant activities in or near the tract.

Mitigation Measures

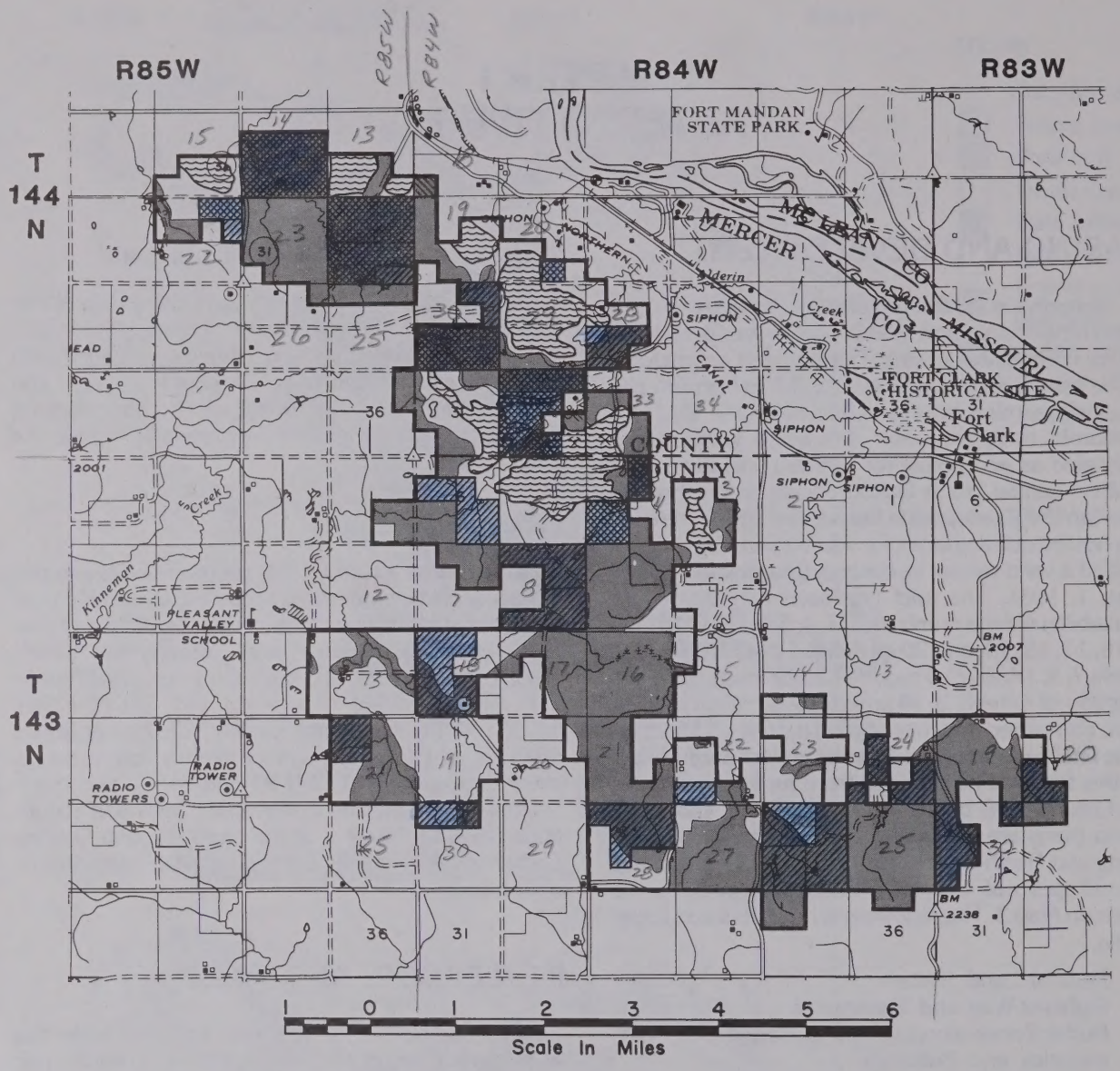
This alternative assumes that proper mining and reclamation will be carried out according to existing state and federal regulations. These include: Office of Surface Mining Reclamation and Enforcement (OSM) regulations (30 CFR 700-899), Environmental Protection Agency (EPA) regulations (40 CFR 0-1399), Council of Environmental Quality (CEQ) regulations (40 CFR 211), Department of Interior coal management regulations (43 CFR 23 and 3400), and North Dakota Public Service Commission laws and regulations (Chapter 38-14.1 of the North Dakota Century Code and Article 69-05.2 of the North Dakota Administrative Code).

NO LEASING ALTERNATIVE

Federal coal would not be offered for lease under this alternative. Federal reserves represent about 21 percent and State reserves about 3 percent of the coal available in the tract.

There were no small business expressions of leasing interest for the area. Considering the amount of federal coal involved, the existing Glenharold mine, the checkerboard pattern of federal coal ownership and the apparent trend in small mine development, near future development of any small coal mines in the tract boundary is not likely.

Approximately 43 million tons of unleased federal coal would be bypassed and would probably never be mined. As discussed in Chapter II, few significant changes to the existing environment would be expected during the next 52 years.



LEGEND

- Federal Coal
- Federal Coal Lease
- Active Strip Mine

Areas being considered as unsuitable by BLM and others based on existing information.

- Wildlife Habitat
- Potential Dwellings

Note: Detailed maps are available for inspection at the Dickinson BLM District Office. (Rights-of-way too numerous to show.)

-N-

GLENHAROLD TRACT

MAP 3

CHAPTER II
AFFECTED ENVIRONMENT

TOPOGRAPHY

The Glenharold tract is located in the Missouri Slope physiographic area which consists of glacial modified bedrock topography. The area is hilly with a relief of about 200 feet locally and contains many wooded draws. The glacial deposits in the area are identified as Mankato Drift.

GEOLOGY AND MINERALS

The Tongue River Member of the Fort Union Formation (Paleocene) forms the bedrock in this area. It consists of light buff-yellow, interbedded sandstone and claystone with lignite beds. Glacial debris of the Wisconsinian glaciation unconformably overlies the bedrock.

The Stanton, Berg, and Yeager beds are the principal lignite resources in the tract. The Stanton bed is stratigraphically the lowest mineable bed in the area. Thickness ranges from 5 to 16 feet. A parting of up to 5 feet occurs in the northwest portion of the tract, with a lower bench less than 5 feet thick. Overburden on the Stanton ranges in thickness from 0 to 170 feet in the tract. The Berg bed ranges in thickness from 5 to 8 feet. Interburden between the Stanton and Berg beds is economically mineable. Overburden on the Berg bed ranges in thickness from 0 to 160 feet in the tract. The Yeager bed becomes mineable in the southeastern portion of the tract. Thickness varies from 5 to 7 feet. Interburden between the Berg and Yeager beds ranges in thickness from 9 to 30 feet. Overburden on the bed ranges from 0 to 140 feet in the tract.

The Stanton and Berg beds are currently being mined by Consolidation Coal Company in the Glenharold mine.

This tract contains about 12,625 acres underlain by 221.0 million tons of reserve base lignite in the three mineable beds. Consolidation Coal Company has 2,229 acres of federal coal under lease. The ownership of the reserve base lignite breaks down as follows: leased federal coal 27.9 million tons; unleased federal coal, 47.0 million tons; state coal, 7.4 million tons; and private, 138.7 million tons.

No oil or gas is being produced from this tract at present. Since the tract is located within the Williston Basin, there is small chance of future production.

PALEONTOLOGY

No fossils of scientific importance are known to occur on this tract.

SOILS AND RECLAMATION POTENTIAL

The soils in the portion of the Glenharold tract covered by this report have formed in residual shale, siltstone and shale, wind deposited silt and sand over glacial till, and alluvium. The residual Cabba and Werner soils, on strong to steeply sloping uplands, are the most common mapping units in the area. They are shallow, well drained, loamy soils of low natural fertility.

Most commonly occupying the gently to moderately sloping uplands are the soils from wind deposited silt (Temvik) and sand (Flaxton) over glacial till and the glacial till itself (Williams). These are deep, well drained, loamy soils of rather high natural fertility.

The alluvial soils are found on nearly level to gently sloping positions on the landscape. They include such soils as the Arnegard, Grail, Grassna, and Straw. These are also deep, well drained, loamy soils of high natural fertility.

The water erosion potential is high over much of the area because of the extensive strong to steep slopes. The wind erosion potential is low to moderate over most of the medium and moderately fine textured soils but high on the fine sandy loams.

Soil quality is reflected in the reclamation suitability ratings and acreage figures for the SCS Order II county soil survey mapping units in the portion of the tract being considered in this report (Table 1 and 2). Of the 10,080 acres involved, 4,765 acres (47%) are in the "good" suitability category, 4565 acres (45%) "fair" and 750 acres (8%) "poor." Flaxton, Temvik, and Williams mapping units compose most of the "good." Cabba, and to a lesser extent Morton and Belfield, units make up most of the "fair." The most common units rated "poor" are the Rhoades and Cabba-Shale outcrop.

The suitability data in Table 2 is displayed by surface landowner in this analysis report because North Dakota law does not allow the transfer of soil material from one landowner to another unless written consent is given. Each surface owner's land must be reclaimed with soil originally removed from his respective holdings. The table therefore indicates the degree of difficulty to reclaim individual landowner holdings based on soil suitability for plant growth material on surface-mined land.

TABLE 2
SUITABILITY OF SOIL FOR RECLAMATION BY LANDOWNER IN THE GLENHAROLD TRACT

LANDOWNER NUMBER	ACRES			
	GOOD	FAIR	POOR	TOTAL
1	131	29	0	160

TABLE 1
GLENHAROLD TRACT - SOILS

Map Symbol and Soil Mapping Unit Name[1/]	Percent Slope[1/]	Soil Erosion Potential[1/] Wind	Water	Overall Suitability of Soil for Use as Cover-Soil Material in Surface-Mine Reclamation[2/]	Soil Hazard Conditions[2/]
28 - Wilton silt loam	1-3	Low	Low	Good	----
28B/TwB - Temvik-Williams silt loams	3-6	Low	Mod	Good	----
28C/TwC - Temvik-Williams silt loams	6-9	Low	Mod-High	Good	----
36C/W1C - Williams loam	6-9	Low	Mod-High	Good	----
38D/ZaD - Zahl-Williams loams	9-15	Low-Mod	High	Fair	Too clayey, some lime
58B - Flaxton-Williams complex	3-6	Mod-High	Low	Good	----
ArA - Arnegard loam	0-3	Low	Low	Good	----
ArB - Arnegard loam	3-6	Low	Low-Mod	Good	----
ArC - Arnegard loam	6-9	Low	High	Good	----
BdA - Belfield-Daglum silt loam	0-3	Low	Low	Fair	Clayey subsoil with excess sodium & salts
BdB - Belfield-Daglum silt loam	3-6	Low	Mod	Fair	Clayey subsoil with excess sodium & salts
BcA - Belfield-Daglum silty clay loam	0-3	Low	Low	Fair	Too clayey, excess sodium & salts

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BcB - Belfield-Daylum silty clay loam	3-6	Low	Mod	Fair	Too clayey, excess sodium & salts
BmB - Belfield-Morton silt loams	3-6	Low	Mod	Fair	Clayey subsoil; Belfield-excess sodium & salts
BmC - Belfield-Morton silt loams	6-9	Low	High	Fair	Clayey subsoil;Belfield-excess sodium & salts
BsA - Belfield-Straw loams	0-3	Low	Low	Fair	Belfield-Clayey subsoil with excess sodium and salts
CaE/82E - Cabba-Shale outcrop complex	15-50	Mod	High	Poor	Too alkaline, some lime; Shale-outcrop - lack of soil
CbD/81D - Cabba-Werner complex	9-15	Mod	High	Fair	Too alkaline, some lime
CbE/81E - Cabba-Werner complex	15-40	Mod	High	Fair	Too alkaline, some lime
ChD - Cohagen-Vebar fine sandy loam	6-30	High	High	Fair	Cohagen-too alkaline
FaA - Farland silt loam	0-3	Low	Low	Good	----
FlA - Flaxton-Livona fine sandy loam	0-3	High	Low	Good	----
FlB - Flaxton-Livona fine sandy loam	3-6	High	Mod	Good	----

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GLENHAROLD TRACT - SOILS

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FlC - Flaxton-Livona fine sandy loam	6-9	High	Mod	Good	----
FwA - Flaxton-Williams loams	0-3	Mod	Low	Good	----
FwB - Flaxton-Williams loams	3-6	Mod	Low-Mod	Good	----
FxC - Flaxton-Williams soils	6-9	High	Mod	Good	----
FxD - Flaxton-Williams soils	9-12	High	High	Good	----
GaA - Grail silt loam	0-3	Low	Low	Fair	Clayey subsoil
GaB - Grail silt loam	3-6	Low	Mod	Fair	Clayey subsoil
GcB - Grail silty clay loam	3-6	Low	Mod	Fair	Too clayey
GcC - Grail silty clay loam	6-9	Low	High	Fair	Too clayey
GnA - Grassna silt loam	0-3	Low	Low	Good	----
GnB - Grassna silt loam	3-6	Low	Mod	Good	----
Ha - Harriet complex	0-3	Mod-High	Low	Poor	----
Hs - Heil silty clay	0-3	Low	Low	Poor	Too clayey, excess sodium

Map Symbol and Soil Mapping Unit Name[1/]	Percent Slope[1/]	Soil Erosion Potential[1/] Wind	Water	Overall Suitability of Soil for Use as Cover-Soil Material in Surface-Mine Reclamation[2/]	Soil Hazard Conditions[2/]
McB - Manning fine sand loam	0-6	High	Low	Good	----
MoB - Morton silt loam	3-6	Mod	Mod	Fair	Clayey subsoil
MoC - Morton silt loam	6-9	Mod	High	Fair	Clayey subsoil
MpA - Morton-Daglum Silt loam	0-3	Mod	Low	Fair	Clayey subsoil; Daglum-excess sodium & salt
MpB - Morton-Daglum silt loam	3-6	Mod	Mod	Fair	Clayey subsoil; Daglum-excess sodium & salt
MpC - Morton-Daglum silt loam	6-9	Mod	High	Fair	Clayey subsoil; Daglum-excess sodium & salt
NfB - Noonan-Flaxton soils	3-6	Mod-High	Low-Mod	Fair	Noonan-excess sodium
Pa - Parnell silt loam	0-3	Low	Low	Good	----
PbA - Parshall fine sandy loam	0-6	High	Low	Good	----
PcA - Parshall loam	0-3	Mod	Low	Good	----
RgB - Regent silty clay loam	3-6	Low	Mod	Fair	Too clayey
RgC - Regent silty clay loam	6-9	Low	High	Fair	Too clayey
RlB - Regent-Daglum silty clay loam	3-6	Low	Mod	Fair	Too clayey; Daglum-excess sodium & salt

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Map Symbol and Soil Mapping Unit Name[1/]	Percent Slope[1/]	Soil Erosion Potential[1/] Wind	Water	Overall Suitability of Soil for Use as Cover-Soil Material in Surface-Mine Reclamation[2/]	Soil Hazard Conditions[2/]
R1C - Regent-Daglum silty clay loam	6-9	Low	High	Fair	Too clayey; Daglum-excess sodium & salt
RoB - Rhoades-Daglum complex	0-9	Low	Mod	Poor	Too clayey, excess sodium & salts
RvE - Ringling gravelly loam	9-40	Mod	High	Poor	Excess rock fragments
SaA - Savage silty clay loam	0-3	Low	Low	Fair	Too clayey
SeC - Sen-Werner loams	3-9	Low-Mod	Mod-High	Good	----
SmB - Sen-Amor loams	3-6	Low-Mod	Mod	Good	----
SmC - Sen-Amor loams	6-9	Low-Mod	High	Good	----
SmD - Sen-Amor loams	9-12	Low-Mod	High	Good	----
SwA - Straw loam	0-3	Low	High	Good	----
Sx - Straw loam channeled	0-6	Low	High	Good	----
Sy - Strongly saline land	0-3	Low	Low	Poor	Excess salts
TmA - Temvik silt loam	0-3	Low	Low	Good	----
Tx - Tonak and Parnell silt loam	0-1	Low	Low	Good	----
VaC - Vebar fine sandy loam	6-9	High	Mod-High	Good	----
VkB - Vebar-Tally fine sand loams	3-6	High	Mod	Good	----

TABLE 1
GLENHAROLD TRACT - SOILS

Map Symbol and Soil Mapping Unit Name[1/]	Percent Slope[1/]	Soil Erosion Potential[1/] Wind	Water	Overall Suitability of Soil for Use as Cover-Soil Material in Surface-Mine Reclamation[2/]	Soil Hazard Conditions[2/]
WaD - Wabek gravelly loam	6-30	Mod	High	Poor	Excess small stones, too sandy, droughty
WlB - Williams loam	3-6	Low	Mod	Good	----
WnC - Williams-Flaxton loams	6-9	Mod	High	Good	----
WzD - Williams-Zahl loams	9-12	Low	High	Good	----
ZaE - Zahl-Williams loams	15-40	Low	High	Fair	Too clayey, some lime

1/ From "Soil Survey of Mercer County, North Dakota" and "Soil Survey of Oliver County, North Dakota"

2/ Derived by applying the properties of the soils which are described in the above mentioned soil survey report and "Official Soil Series Descriptions" to the guidelines developed by BLM-Montana State Office and adapted from information by Wm. Schafer, the Soil Conservation Service (SCS), and the Office of Surface Mining (OSM).

2	127	27	6	160
3a	12	62	6	80
b	95	14	11	120
c	451	135	14	600
d	96	19	5	120
5a	129	31	0	160
b	32	88	0	120
6	220	20	0	240
7	9	151	0	160
8	1	110	49	160
9	70	10	0	80
10	204	116	0	320
11	24	16	0	50
12	22	18	0	40
13	61	19	0	80
14a	3	35	2	40
14b	0	34	6	40
15	124	6	30	160
17	57	23	0	80
18	79	1	0	80
19	11	29	0	40
20a	6	34	0	40
b	89	66	45	200
c	11	127	22	160
d	204	863	53	1,120
21	360	50	70	480
22	0	80	0	80
23a	76	44	0	120
b	36	223	61	320
c	148	12	0	160
24a	127	30	3	160
b	80	221	19	320
c	0	40	0	40
25a	1	53	0	54
b	417	52	11	480
c	0	40	0	40
26a	258	209	93	560
b	26	82	12	120
27	8	23	9	40
28	56	104	0	160
29a	183	88	9	280
b	438	483	119	1,040
c	52	17	11	80
30	5	62	13	80
31a	32	128	0	160
b	10	358	18	386
32	120	6	34	160
34	64	77	19	160
TOTALS	4,810	4,531	744	12,442
% OF TOTAL	47%	45%	8%	100%

1/ Based on Table 1. Planimetry by BLM. Legal description of land and owner name corresponding to landowner number available at Dickinson District Office. Individual landowner holdings that are not contiguous are depicted separately by small letters.

HYDROLOGY

Surface runoff from this tract drains to the Missouri River through Alderin Creek and an unnamed creek. These streams have some base flow but generally do not flow year round. Surface runoff averages about one inch per year in this area. Water is currently being impounded in the Alderin Creek drainage by Consolidation Coal Company's Glenharold mining operation. Surface water quality is typically a sodium bicarbonate sulfate type. Surface water is used for stock watering and wildlife purposes.

The Fox Hills—Basal Hell Creek and Upper Hell Creek—Lower Ludlow are regional aquifers that occur beneath this tract. The Lower Tongue River aquifer may also underlie the south portion of the tract. The lignite beds in the northern portion of this tract are generally dry. Wells located along the south edge of the tract indicate that water probably partially saturates lignites in the southern portion of the tract. The flow system is probably local in extent and reflects topographic control. Only a small amount of groundwater in the tract is used for stockwater and domestic supplies.

VEGETATION AND AGRICULTURAL PRODUCTION

The Glenharold tract is extensively used for agricultural purposes. Dryland farming methods, including alternate year summer-fallow cropping rotations, are widely practiced in the area. Two percent (255 acres, Mercer County and Oliver County ASCS, 1981) is fallow each year (Table 3).

TABLE 3
AGRICULTURAL LAND USE
ON THE GLENHAROLD TRACT

Land Use:	Tract Acres	Average Production Per Acre 1/	Total Annual Production
Cropland	1,759	25.2 bu.	44,327 bu.
Hayland	1,358	1.55 tons	2,105 tons
Range	9,070	.5 AUMs	4,535 AUMs
Other	0	1.55 tons	70 tons
Fallow	255	n/a	n/a
Total	12,442	n/a	n/a

1/ Crop : wheat equivalent bu./acre
Hayland: tons/acre of hay
Range : AUMs/acre
Other : tons/acre of hay equivalent

Small grains including spring wheat, oats, corn, barley, flax, and sunflowers (in descending order of acreage grown) are grown on 14 percent (1,759 acres) of the tract. Wheat yields average 25.2 bushels per acre. Much of the cropland production, especially the wheat portion, is sold as a cash crop. Oats, barley, and corn are also used as feed grains in livestock operations.

Eleven percent (1,358 acres) of the tract is used for growing hay for use in overwinter livestock feeding. Approximately 1.55 tons of hay are produced per acre.

Seventy-three percent (9,070 acres) of the tract is rangeland and pastureland. Rangeland produces about .5

Animal Unit Months (AUMs) per acre. An AUM is the amount of grass needed to support a cow/calf for one month. Beef cattle are the predominant kind of livestock (North Dakota Crop and Livestock Reporting Service, 1980). There are also some dairy cattle, hogs, and sheep.

There are approximately 20 acres of shelterbelts, field windbreaks, and farmsteads per operation. There are numerous woody draws in the tract which are populated by native trees and shrubs.

Except for reseeded rangeland, the rangeland is in the widespread Mixed Grass Prairie type (Shaver, J.C. 1977). This includes species such as needle and thread, little bluestem, prairie sandreed, western wheatgrass, blue grama, side-oats grama, plains muhly, sedges, snowberry, fringed sagewort, and silver sage.

No threatened or endangered plant species, as published in the 1980 federal list, have been identified within the tract.

There are 26 operators and operator partnerships in the tract (Table 4). Operations range in size from 40 acres to 2,040 acres inside the tract and from 160 acres to 4,648 acres for the total operations.

Agriculture in the area includes crop operations, livestock operations, and mixtures of both. Most operations in the area include a balance between crops and livestock.

Fifty-four percent of the operations have less than 30 percent of their lands within the tract. Few operations have a large percentage of their acreage within the tract. Overall, the tract covers 31 percent of the acreage of the operations involved.

Thirty-one percent of the acreage within the tract is farmed by lessees, or operators who do not own the land. Sixty-nine percent is farmed by owner/operators.

AGRICULTURAL ECONOMICS

This section will be forthcoming under separate cover.

LAND USE

Agriculture predominates land use on the Glenharold tract. The area also includes an active coal mine, operated by Consolidated Coal under private and federal leases, powerlines and minor roads. Over time coal production will continue in order to supply a power plant. In the long-term the area would be reclaimed and agricultural use would be reestablished in the area.

RECREATION

Hunting of a variety of species (deer, upland game birds, waterfowl) is the only recreational opportunity offered to the public on the tract. This opportunity, while significant to local people, has limited attraction to people outside the immediate vicinity of the proposed mining.

The community of Stanton, North Dakota offers recreational opportunities in the general vicinity of the tract. A ball diamond, park, and gymnasium facilities offer adequate opportunities at this time. The Missouri River, east of the tract offers state and federal recreational opportunities.

AESTHETICS

The Glenharold tract is primarily range and pastureland and thus appears to be in a more or less natural state. Cropland and other agricultural use is also apparent. Existing coal mining is not obvious except in certain views and then not for long periods of time.

Views of the tract are primarily from alternate State Highway 200. Land forms outside of the north tract boundary form a natural screen to the area. A power plant to the north of the highway dominates views from the highway, thus the tract itself, less dramatic by comparison, receives little attention.

WILDLIFE

Native prairie dominates this broken topography with its highly interspersed native woodlands and some wetlands. This country does not lend itself to farming so agriculturally disturbed areas total only 25.4 percent; native woodlands, 12.2 percent; native prairie, 42.3 percent; and wetlands, 2.7 percent. Mining has destroyed 17.4 percent of this Missouri River breaks habitat as of August, 1980. These habitat totals are of the 17,936 acres photointerpreted for wildlife resources.

Woodlands, wetlands, and native prairie provide essential habitat for 31 sensitive species throughout the biological year (Table 5). Whooping cranes, an endangered species, migrate through this area and use the wetlands.

The Missouri River Breaks, running northwest-southeast through the length of the proposed area, has the highest level of essential habitat interspersion in the region. Such interspersion provides the greatest amount of edge, has the highest wildlife diversity and largest populations.

Farming in this glaciated area has been confined to the least dissected topography, which left the area woodlands essentially undisturbed.

Wetlands, specifically prairie potholes, are the most productive wildlife habitat in North Dakota.

TABLE 4
FARM/RANCH OPERATIONS - GLENHAROLD TRACT

	INSIDE COAL TRACT (ACRES)							OUTSIDE COAL TRACTS (ACRES)							
OPERATOR	SMALL GRAIN CROP	HAY	GRAZING	SUMMER FALLOW	OTHER	TOTAL	PERCENTAGE OF TOTAL ACRES LEASED	SMALL GRAIN	HAY	GRAZING	SUMMER FALLOW	OTHER	TOTAL	GRAND TOTAL	PERCENTAGE OF TOTAL ACRES IN TRACT
1	0	70	90	0	0	160	0	0	124	76	0	0	200	360	44
2	351	181	670	0	0	1200	27	111	275	414	0	0	800	2000	60
3	51	46	172	11	0	280	0	369	17	371	81	0	838	118	25
4	0	155	545	0	0	600	100	199	310	1331	0	0	1840	2440	25
5	149	0	41	50	0	240	0	328	75	996	56	0	1455	1695	14
6	0	0	320	0	0	320	50	162	16	346	96	0	620	940	34
7	137	138	205	0	0	480	100	0	0	0	0	0	0	480	100
8	99	0	33	28	0	160	100	250	149	223	19	0	640	800	20
9	58	85	97	0	0	240	67	181	108	272	0	0	560	800	30
10	98	58	0	4	0	160	0	54	58	126	2	0	240	400	40
11	54	33	24	9	0	120	33	609	209	1785	57	0	2680	2800	4
12	80	0	0	0	0	80	0	327	201	291	0	0	880	960	8
13	0	15	25	0	0	40	100	656	178	685	0	0	1520	1560	3
14	39	0	38	3	0	80	0	863	224	1238	75	0	2400	2480	3
15	0	20	20	0	0	40	100	160	164	436	0	0	760	800	5

TABLE 4
FARM/RANCH OPERATIONS - GLENHAROLD TRACT

	INSIDE COAL TRACT (ACRES)							OUTSIDE COAL TRACTS (ACRES)							
OPERATOR	SMALL GRAIN CROP	HAY	GRAZING	SUMMER FALLOW	OTHER	TOTAL	PERCENTAGE OF TOTAL ACRES LEASED	SMALL GRAIN	HAY	GRAZING	SUMMER FALLOW	OTHER	TOTAL	GRAND TOTAL	PERCENTAGE OF TOTAL ACRES IN TRACT
16	58	0	400	4	0	462	100	64	32	342	2	0	440	902	51
17	35	0	881	4	0	920	100	364	366	1749	41	0	2520	3440	27
18	0	89	1391	0	0	1480	0	1522	549	1098	0	0	3168	4648	32
19	202	92	511	35	0	840	0	312	100	476	132	0	1020	1860	45
20	0	17	303	0	0	320	100	202	59	215	4	0	480	800	40
21	49	131	553	5	0	738	43	617	171	1119	113	0	2030	2768	27
22	103	81	176	0	0	360	0	222	77	621	0	0	920	1260	29
23	135	86	528	91	0	840	81	49	36	323	32	0	440	1280	66
24	61	129	1839	11	0	2040	0	321	142	719	58	0	1240	3280	62
25	0	0	80	0	0	90	0	0	0	240	0	0	240	320	26
26	0	32	128	0	0	160	0	0	0	0	0	0	0	160	100
TOTAL	1759	1358	9070	255	0	12,442	31	7942	3640	15,493	767	0	27,842	40,284	31

TABLE 5
WILDLIFE HABITAT AND SPECIES

Woodlands	Wetlands	Native Prairie	Agriculturally Disturbed
*Sharptail Grouse	*Hungarian Partridge	*Sharptail	Sharptail
*Hungarian Partridge	Mourning Dove	Hungarian Partridge	Hungarian Partridge
*Mourning Dove	*Pheasant	Mourning Dove	Mourning Dove
*Pheasant	*Mallard	*Whooping Crane	Pheasant
*Merlin	*Gadwall	*Merlin	Whooping Crane
*Swainson's Hawk	*Whooping Crane	Swainson's Hawk	Swainson's Hawk
Marsh Hawk	*Pintail	Marsh Hawk	Marsh Hawk
Ferruginous Hawk	*Greenwing teal	*Burrowing Owl	Ferruginous Hawk
*Loggerhead Shrike	*Widgeon	*Ferruginous Hawk	Whitetailed Deer
*Whitetailed Deer	*Shoveler	Loggerhead Shrike	Red Fox
*Mule Deer	*Redhead	Whitetailed Deer	Badger
Mink	*Canvasback	*Mule Deer	No. Swift Fox
Beaver	*Ruddy	*Antelope	
Red Fox	*Sandhill Crane	Mink	
Badger	*Swainson's Hawk	Red Fox	
No. Swift Fox	*Marsh Hawk	*Badger	
*Bobcat	*Sprague's Pipit	*No. Swift Fox	
	*Whitetailed Deer	Bobcat	
	*Muskrat		
	*Mink		
	*Beaver		
	*Red Fox		
	Badger		

*Essential habitat for species

The immediate proximity of the Missouri River places a high demand on the Breaks habitats for a number of sensitive species throughout the biological year. The bald eagle, another endangered species, is, during spring and fall migration, common on the Missouri River adjacent to the proposed mining area.

Native grasslands represent relics of the original prairie ecosystem. Unplowed prairie in North Dakota is only 20 percent of the original total.

CULTURAL RESOURCES

Four intensive cultural surveys have been conducted on the tract. Forty-five percent of the total acreage in the tract has been the subject of cultural resources inventory. Additionally, 50 percent of the surface over federal coal has been inventoried. Activity from a long time range has been recorded. This activity is seen in prehistoric open plains and breaks task specific exploitative sites (i.e., bison kill sites; lithic scatters of varying size, density and function), more complex multi-task prehistoric sites (i.e., linear and conical mounds; intensive human habitation sites) and various kinds of historic sites including farmsteads and coal mines.

Prehistoric cultural resources patterning reflects a strong attraction to the uplands-breaks juncture that occurs in the tract. This clustering has taken place because the juncture offers permanent water. Avoidance of mining activity at the juncture and the wooded areas associated with it will allow for the mining of coal without the disruption of significant numbers of prehistoric cultural resources.

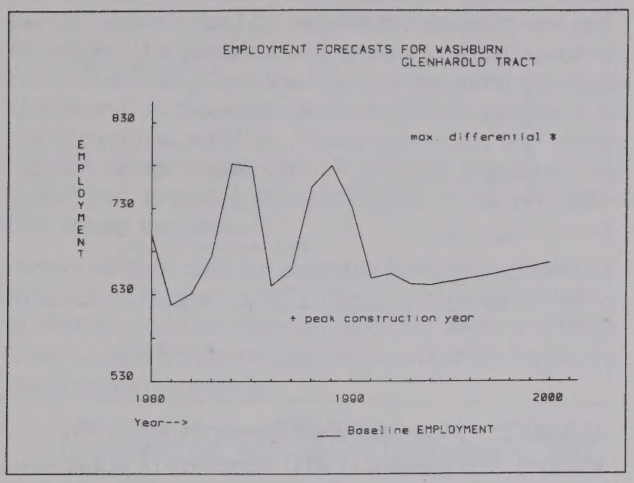
The dominant human use of the area in the historic period has been farming. Stock raising has been a minor use. Most evidence of historic activity is oriented toward farming activity. This activity, which continues to the present time, has disturbed some cultural resources from earlier times.

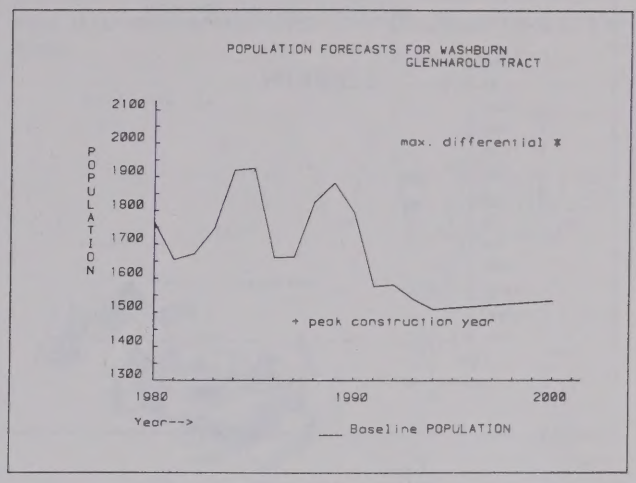
ECONOMIC AND SOCIAL CONDITIONS

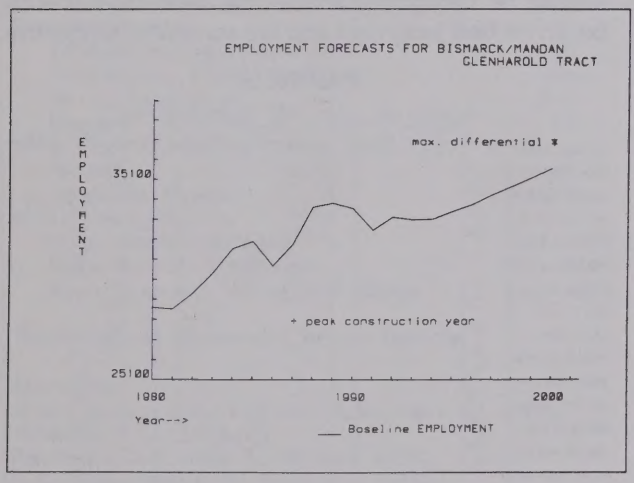
Existing and forecasted population and employment levels for the communities of Washburn, Bismarck/Mandan, Beulah, Hazen, and Stanton, North Dakota are shown in Figure 1 (Population and employment forecasts: Mountain West 1981). As can be seen from these figures, future population levels without federal coal leasing show considerable fluctuations through the early 1990's due to the construction of energy projects not directly related to the leasing of federal coal.

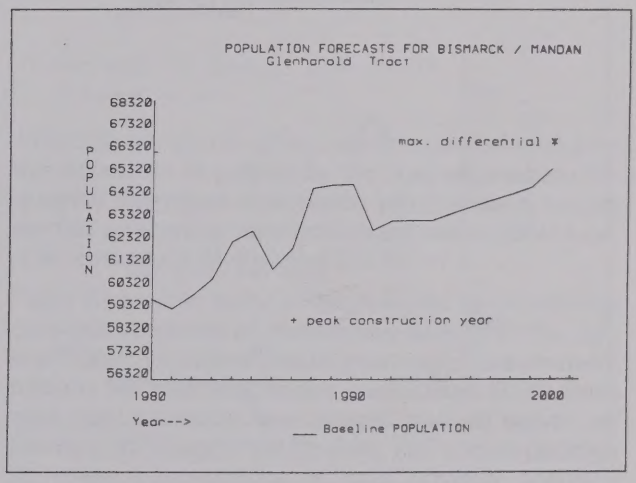
The majority of the Glenharold mine (with which the Glenharold tract is associated) employees currently reside in Washburn, Bismarck, Mandan, Beulah, Hazen, and Stanton (Dave Waldrun. 1981. Personal commun-

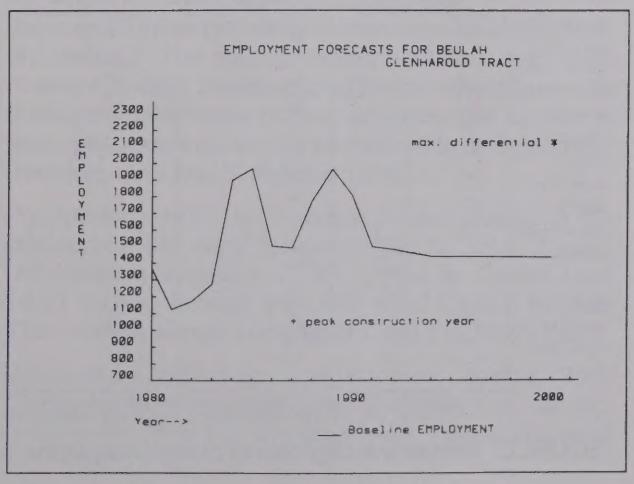
FIGURE 1


EMPLOYMENT FORECASTS FOR WASHBURN
GLENHAROLD TRACT
EMPLOYMENT
830
730
630
530
max. differential *
+ peak construction year
1980
1990
2000
Year-->
___ Baseline EMPLOYMENT


POPULATION FORECASTS FOR WASHBURN
GLENHAROLD TRACT
POPULATION
2100
2000
1900
1800
1700
1600
1500
1400
1300
max. differential *
+ peak construction year
1980
1990
2000
Year-->
___ Baseline POPULATION


EMPLOYMENT FORECASTS FOR BISMARCK/MANDAN
GLENHAROLD TRACT
EMPLOYMENT
35100
25100
max. differential *
+ peak construction year
1980
1990
2000
Year-->
___ Baseline EMPLOYMENT


POPULATION FORECASTS FOR BISMARCK / MANDAN
Glenharold Tract
POPULATION
68320
67320
66320
65320
64320
63320
62320
61320
60320
59320
58320
57320
56320
max. differential *
+ peak construction year
1980
1990
2000
Year-->
___ Baseline POPULATION


EMPLOYMENT FORECASTS FOR BEULAH
GLENHAROLD TRACT
EMPLOYMENT
2300
2200
2100
2000
1900
1800
1700
1600
1500
1400
1300
1200
1100
1000
900
800
700
max. differential *
+ peak construction year
1980
1990
2000
Year-->
___ Baseline EMPLOYMENT

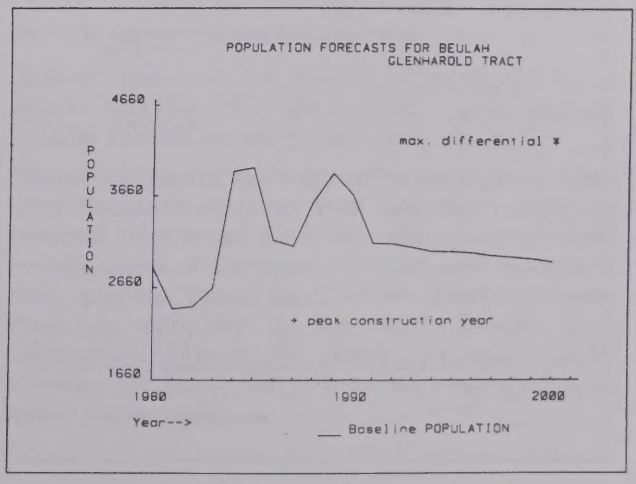
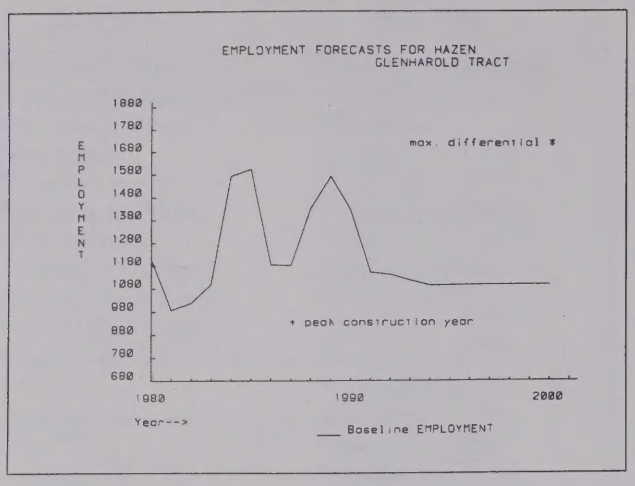
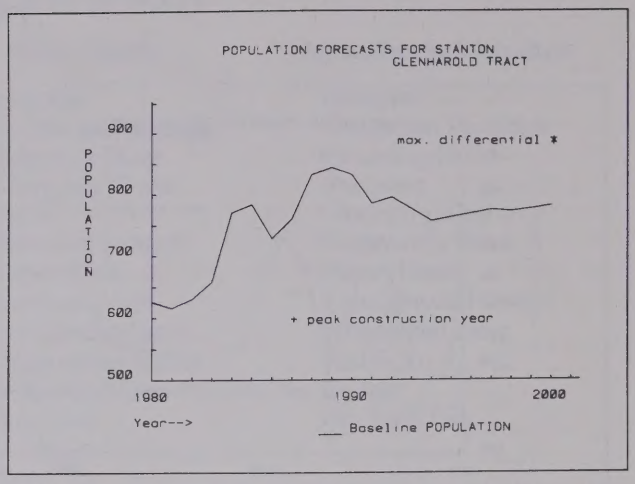
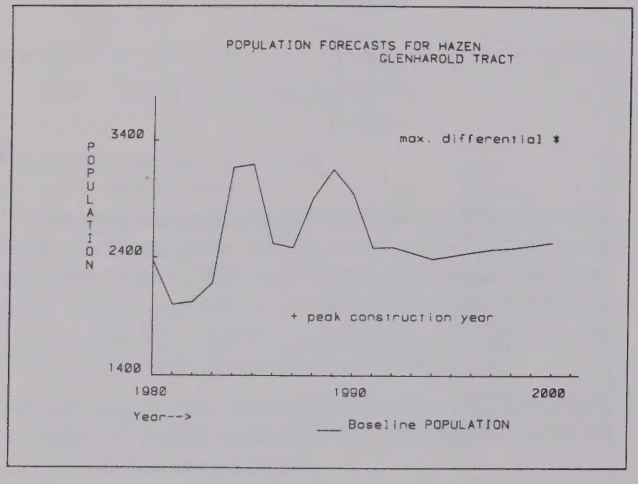
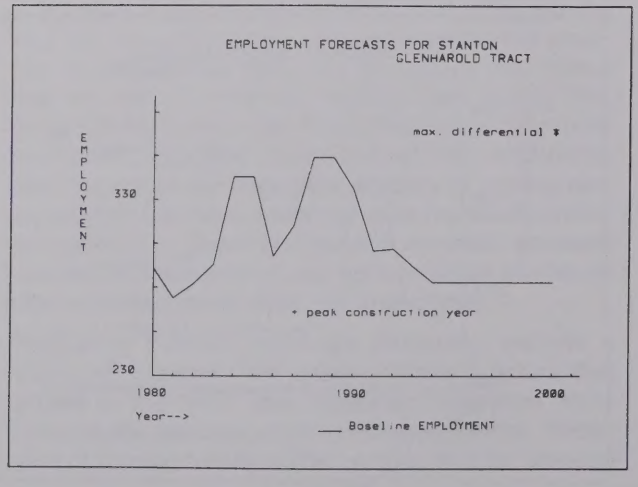

POPULATION FORECASTS FOR BEULAH
GLENHAROLD TRACT
POPULATION
4660
3660
2660
1660
max. differential *
+ peak construction year
1980
1990
2000
Year-->
___ Baseline POPULATION

FIGURE 1 (continued)







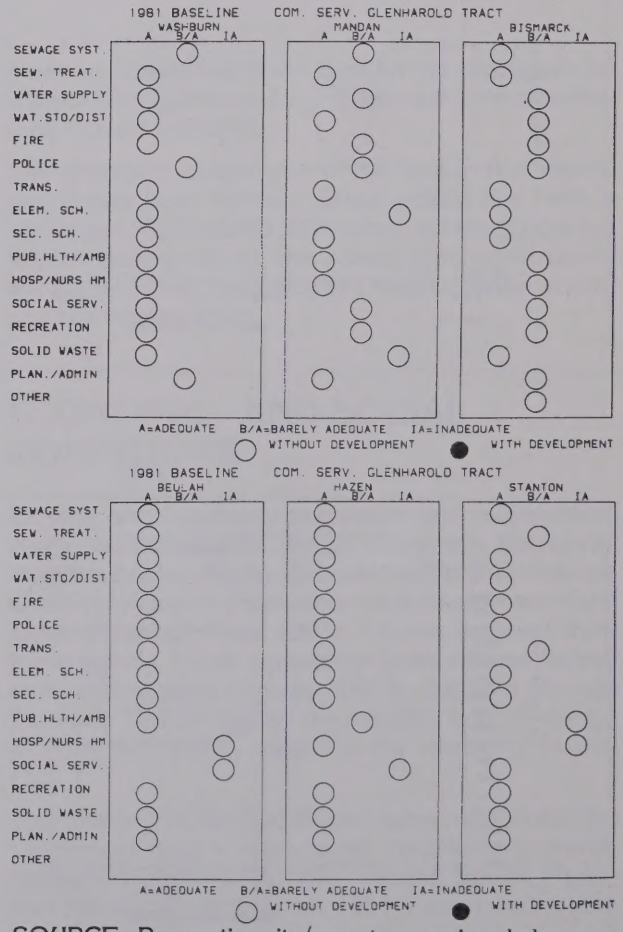


SOURCE: Mountain West Research, Inc., 1981.

ication). The present (1981) condition of public services in the six communities is shown in Figure 2.

The adequacy ratings in Figure 2 reflect assessments by city planners, county planners, and town councils. It should be recognized that some assessments were based on best judgment and are somewhat subjective.

FIGURE 2



SOURCE: Respective city/county or regional planners.

CLIMATE AND AIR QUALITY

The climate of western North Dakota is typically continental, characterized by variable temperature and precipitation. The predominant pressure systems, out of the Gulf of Mexico and the Arctic, account for the rapid alterations of meteorological conditions common to the area. Cold polar air masses dominate the winter months, while moist Gulf air masses prevail in the spring and summer, distributing the major precipitation across the area.

Meteorological data are available from several stations in the area (Tables 6 and 7). The meteorological station at Center and the National Weather Service (NWS) West Central Region will be used to establish the tract's benchmark climatology.

TABLE 7
REPRESENTATIVE REGIONAL METEOROLOGICAL DATA

	Regional Values
Humidity (Annual Average), %	40-50
Lake Evaporation (Annual Avg.), in.	50-55
Extreme Weather	
Thunderstorms, days/year	30
Tornadoes, sightings/year	rare
Hail, days/year	2-4
Maximum recorded wind speed, mph*	72
Inversion Frequency (base 1500 ft.), %	
Annual	35
Seasonal Range	30-50
Mixing Height, ft.	
Mean Annual Morning	984-1312
Mean Annual Afternoon	4921-5249
Mean Seasonal Afternoon Range	1968-7874

*Recorded at Bismarck, North Dakota

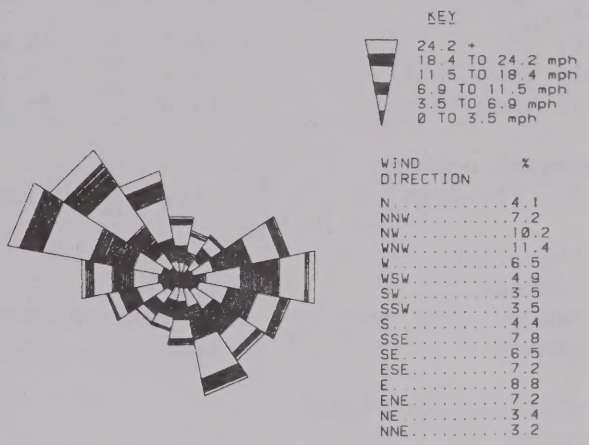
Sources:
Brum, L.J., J.W. Enz and J.M. Ramirez 1978.
Jensen, R.E. 1974.
Ramirez, J.M. and T. Method 1976.
U.S. Department of Commerce 1974.

The annual mean temperature for the area is 40.5°F with a highest monthly mean temperature of 69.0°F (in July), and a lowest monthly mean temperature of 8.5°F (in January). The average growing season is approximately 120 days; the last spring freeze generally occurs during the third week of May, while the first fall freeze generally occurs during the second week of September (Ramirez, J.M. and T. Method 1976).

Precipitation in the area occurs predominately in the late spring and early summer (May to July). Annual precipitation averages 17.83 inches at Center, and 16.91 inches through the NWS West Central Region. The average annual snowfall at Center is 29.8 inches.

Wind data used for this analysis were obtained from Bismarck, the closest station in the vicinity that had data suitable for input into the dispersion model. The wind rose in Figure 3 represents a summary of this data. Winds prevail from the WNW to NNW at Bismarck (29 percent frequency of occurrence). Wind speeds average 10.2 mph and exceed 11.5 mph 36 percent of the time.

FIGURE 3



WIND ROSE FOR BISMARCK NORTH DAKOTA

Although the terrain offers only limited obstruction to the dispersion of pollutants, the area experiences frequent temperature inversions, which reduce mixing heights and tend to concentrate pollutants (Brun L. J., J. W. Enz and J. M. Ramirez 1978).

Table 8 presents some of the available air monitoring data from ambient air monitoring stations in the general vicinity. Recorded annual geometric mean concentrations for total suspended particulates (TSP) from area rural locations have ranged from 19 ug/m^3 (at Stanton) to 32 ug/m^3 (at Beulah). TSP annual geometric mean concentration at local privately operated impact source monitoring sites have ranged from 19 ug/m^3 (at RAMP #3, Beulah). For the purpose of the following computer analyses, the background rural TSP levels will be set at 24 ug/m^3 for the annual level and 100 ug/m^3 for the 24-hour level.

Gaseous pollutants that have been monitored in the area include SO_2, NO_2, O_3, and H_2S. No violations of Federal or State standards have been reported.

Three Class I areas, the North and South Units of Theodore Roosevelt National Park and the Lostwoods National Wilderness Area, fall within the potential impact range of the proposed tract and associated developments. Based on 1979 air quality computer modeling estimates by the North Dakota State Department of Health, the allotted 24-hour SO_2 increment for the South Unit of the Park is consumed, or nearly consumed.

TABLE 6*
METEOROLOGICAL DATA FOR SELECTED SITES

Parameter	Center	Beulah	Washburn	New Salem	Bismarck (WSO)	NWS West Central Region
Temperature, °F						
$\bar{X}$ annual, °F	40.5	40.6	41.9	41.4	41.5	40.6
$\bar{X}$ monthly low (Jan)	8.5	7.6	9.3	9.8	8.2	8.4
$\bar{X}$ monthly high (July)	69.0	69.3	70.8	69.9	70.8	69.4
Average growing season (temp. 32° F), days	117	121	133	128	133	120
Precipitation, in.						
Annual average	17.45	17.20	18.01	16.65	15.15	16.91
Annual range	0.48-3.55	0.32-3.97	0.35-4.11	0.34-3.77	0.36-3.40	0.40-3.92
Annual snowfall	29.8	27	30	34	40	30
Annual stability, (by class)						
% occurrence						
Class A, B, C					14.3	
Class D					56.4	
Class E, F, G					29.3	
Wind direction, (%)					W-NW(28)	
Wind speed, mph (% of time)					0-3.5 (15.8)	
					3.6-6.9 (20.6)	
					7-11.5 (27.1)	
					11.6-18.4 (23.8)	
					18.5-24 (9.3)	
					>24 (3.3)	
Average wind speed, mph					10.8	

*SOURCES:

Jensen, R. E. 1972.
North Dakota Crop & Livestock Reporting Service 1980.
Ramirez, J. M. and T. Method 1976.
Ramirez, J. M. 1972.
Ramirez, J. M. 1973.
U.S. Department of Agriculture 1978
U.S. Department of Commerce 1948-1974; 1973; 1974; 1979.

TABLE 8
WEST CENTRAL NORTH DAKOTA AIR MONITORING DATA*

Monitoring Site	Year	Parameter	No. Observations	Max. Observation (ug/m^3)	2nd Max. Observation (ug/m^3)	Annual Geom. Mean (ug/m^3)	Annual Arith. Mean (ug/m^3)
			State-Operated Sites:				
Stanton (rural)	76	TSP	61	150	104	31	39
	77	TSP	60	237	90	24	32
	78	TSP	58	104	67	19	24
	79	TSP	42	90	80	19	25
Washburn (rural)	76	TSP	55	127	82	27	35
	77	TSP	55	154	100	25	33
	78	TSP	36	128	108	23	34
Beulah (rural)	74	TSP	10	488	47	26	69
	75	TSP	39	171	141	24	37
	76	TSP	51	81	61	24	29
	77	TSP	58	224	73	24	31
	78	TSP	52	288	258	32	52
	79	TSP	28	82	78	22	28
			Privately-Operated Impact Source Monitoring Sites:				
MN Power & Light Bittner	80**	TSP		47		19	
		SO_2		191			<5
MN Power & Light Orgaard	80**	TSP		63		22	
		SO_2		141			<5
Ramp #1 Beulah	79	TSP	11	161	93	57	69
		SO_2	1403	78	65	<5	<5
	80	TSP	59	642	125	24	41
		SO_2	6250	81	63	<5	<5
Ramp #2 Beulah	79	TSP	11	76	74	42	47
		SO_2	1401	52	52	<5	<5
	80	TSP	57	613	156	25	45
		SO_2	6251	91	84	<5	<5
Ramp #3 Beulah	79	TSP	11	1000	114	85	158
		SO_2	1403	47	39	<5	<5
	80	TSP	58	141	96	26	34
		SO_2	6239	148	107	<5	<5
Ramp #4	79	TSP	11	121	120	85	158
		SO_2	1403	102	63	<5	<5
	80	TSP	41	523	161	26	34
		SO_2	4141	165	151	<5	<5
Ramp #5 Beulah	79	TSP	11	129	89	45	56
		SO_2	1404	37	31	<5	<5
	80	TSP	59	707	126	21	41
		SO_2	6164	60	57	<5	<5

* SOURCE - North Dakota State Department of Health
**Samples from third and fourth quarter (July-December)

CHAPTER III
ENVIRONMENTAL CONSEQUENCES

TOPOGRAPHY

The natural contour of the land over the unleased federal coal would be modified during surface mining. In total 12,625 acres would be disturbed during the assumed 52 year mine life. Although most would be returned to its approximate original contour, difference in detail would remain, including drainage patterns and final sloped highwalls.

In general, the reshaped ground would not be steep enough to cause slope failures and related hazards. Until natural vegetation can be reestablished, accelerated erosion would be a potential problem.

GEOLOGY AND MINERALS

The major impact of the leasing alternative would be the addition of 25.1 million tons of recoverable federal coal to the reserves available for mining. These reserves might very well be bypassed if not leased. Mineral resource conflicts might occur between the development of oil and gas and of the coal development, since there is at least some potential for finding oil and gas on the tract.

SOILS AND RECLAMATION POTENTIAL

The types of impacts affecting the soil resource in this area have previously been discussed in Bureau of Land Management planning documents (URA, MFP, TEEA) and the Draft West Central North Dakota Regional Environmental Impact Study. Briefly, the basic impacts, if mining proceeds, are the disruption of the present soil bodies with temporary loss of productivity and problems with erosion, compaction, soil removal and replacement, and instability.

Soil erosion and compaction would not be new to the tract because of the presence of dryland agricultural activity and coal mining. About 14 percent of the area involved in this analysis is annually cropped with 2 percent left bare of protective cover due to summerfallowing. The Glenharold Mine has been active in this tract for a number of years already. Therefore, erosion and compaction impacts will continue in the area but should not cause significant detrimental effects to the soil resource if the required stipulations are followed.

Stripping of suitable soil material may be difficult on the steep slopes which are common in the area. Extra care will be required to operate removal equipment so as to maximize the amount of suitable soil that is saved. Control of surface runoff will be very important during this time to avoid soil loss and sedimentation problems in the drainageways, some of which are filled with valuable woody vegetation.

Some instability problems usually appear with the onset of reclamation. Area-wide settling, localized subsidence or collapse, and underground erosion, or piping, may occur (Groenwald, 1980).

Basically, if the stipulations covering the handling of soils and overburden during surface mining operations are closely adhered to and enforced, instability impacts should be minimal.

The soils will be lost to the production of grass, forage, and grain over the short-term use (about 10 years for each annual disturbance of 240 acres) of the tract for coal mining. This loss would occur only on the active portion of the mine at any given time. Once in full operation, the total tract area out of production in any peak mining year is estimated at 2,400 acres. Soils would be continuously replaced on mined out areas and brought back into production during the life of the mine (52 years).

Preliminary indications from completed and ongoing research by such agencies as the Science and Education Administration—Agricultural Research (SEA-AR) of Mandan, North Dakota, and North Dakota State University—Agricultural Experiment Station (NDSU-AES) of Fargo, are that agricultural productivity of mined land can be restored. Much depends, however, on the planning and implementation of a concerted reclamation effort (Power, 1974). This would be especially important for this portion of the Glenharold tract because the extensive steep slopes with numerous woody draws will make mining and reclamation difficult and expensive.

With reclamation, however, successful return of agricultural productivity should be possible. Table 2 indicates that landowners have sufficient acreage of soil rated "good" and "fair" for supplying cover soil material in surface-mine reclamation. However, due to the difficulty of removing some of the soil on steep slopes rated "fair," it might be necessary to borrow suitable plant growth material from the overburden. Data from core drill holes tested for Consolidation Coal's Glenharold Mine, located within this tract indicate that in some areas a portion of the top 25 to 50 feet of overburden is suitable for reconstructing soil profiles. By averaging suitable plant growth material from the better soils and/or overburden and leaving steeper slopes more gently sloping after reclamation, it might be possible to improve the overall productivity of the land, especially that portion rated "poor."

HYDROLOGY

During the time that an area is being mined, all of the surface runoff from the disturbed area must be impounded and not released until it meets specified quality standards. An exception to this is when storm runoff exceeds the design capacity of the reservoir. Water that collects in open mine pits is also often pumped into these surface water reservoirs. While these runoff catchment basins are in place, total water yields would be decreased due to increased evaporation and infiltration at the reservoirs. Mining operations in the Alderin Creek drainage are currently impounding water.

Water which is released from impoundments would generally have less suspended solids, higher dissolved solids and higher sodium absorption ratios. At this time it is impossible to predict exactly how much difference there would be in these water quality constituents.

Mining in the north part of this tract has not altered groundwater significantly. As mining moves south more water would be encountered and significant impacts may occur. Lignite and sand beds in the mine disturbance zone that act as water sources for local wells would be destroyed.

While the mine pits are open, water levels in the lignite aquifers would be drawn down in the area surrounding an open pit. The distance this drawdown would occur from an open pit is variable and dependent upon the local aquifer characteristics.

The physical disturbance caused by mining would also result in changes in the chemical quality of the local groundwater. Increases in sodium, sulfates and total dissolved solids concentrations have been reported by Groenewold (1979 and 1980) at other mines in North Dakota with similiar overburden. The changes in water quality were variable but dependent upon overburden characteristics and reclamation practices. The quality of water in the replaced overburden would be similarly degraded.

There are between four and ten wells that are located within the tract and their water source could be destroyed or degraded. Between 10 and 25 other wells may experience temporary water level drawdowns.

VEGETATION AND AGRICULTURAL PRODUCTION

The proposed action would progressively remove an average of 240 acres of the total tract area per year from its current uses. The major use of these lands is rangeland. The first land taken out of agricultural operations, except for the plant site and ancillary facilities, will occur in the first year of mining. The period of removal from agricultural production would be the time spent in mining and land reclamation. The entire tract would be progressively mined over a 52 year period.

Mining would be the land use of any one location for one to five years depending on the type of mining. Land reconstruction to premining levels of agricultural production would require a total of approximately ten years. The land would be placed into the premining type of agricultural production or other premining uses that the landowner and Public Service Commission agree upon (wildlife habitat, woodlands, or rights-of-way). Vegetation reestablishment would occur during the first appropriate season after grading to topography and replacing of topsoil.

The company would be under bond for at least ten years, or as long as necessary to prove, at a 90 percent confidence level, that agricultural productive capacity has been restored. (Public Service Commission, Reclamation Department, 1980). Reclamation research by such agencies as the Science Education Administration—Agricultural Research Service (SEA-ARS) and North Dakota State University Agricultural Experiment Station (NDSU-AES) indicates that some degree of optimism for the restoration of land to agricultural production is justified. There is no certainty as to how long it would be before all mined land would be judged as fully restored as the law requires.

The leasing development alternative would have a significant short-term impact on individual agricultural operations, which include land over federal coal, in the tract. By the end of the 52-year mine life, 12,442 acres of the tract would be disturbed, in addition to 160 surface acres used for existing mine facilities.

An average of 33 acres of cropland, excluding summer fallow, would be removed from production each year. This would be an average annual loss of 832 bushels of wheat. This 33 acres of cropland would be out of production ten years with a maximum loss of 8,417 bushels of wheat annually.

Peak mining year disturbance of 258 acres of hayland on operations with land over federal coal would result in an annual loss of 400 tons of hay production.

An average of 174 acres of rangeland, on operations which include land over federal coal, would also be removed from production each year, resulting in an average loss of 87 AUMs. This 174 acres of rangeland would be out of production ten to fifteen years with a maximum of 1,723 acres out of production in any one peak mining year, resulting in a maximum annual loss of 861 AUMs.

Regionally, these losses would not pose significant reductions in area agricultural production.

Time constraints necessitated the Bureau of Land Management's doing agricultural data collection on the preliminary logical mining unit instead of the later final logical mining unit. The data may not completely represent the logical mining unit in its final form.

In the reestablished native-type range it is likely that some introduced species will be used. The laws required that introduced species be of the same seasonal variety and equal or superior in utility to the native species. Some of the more sensitive plants (for cropland, woodland, or rangeland use) may have difficulty in becoming established on some of the less suitable soils.

Forbs, woody plants, and trees (woodlands) must be reestablished along with grasses.

AGRICULTURAL ECONOMICS

This section will be forthcoming under separate cover.

LAND USE

The leasing of coal in this tract would perpetuate an existing situation. With reclamation, as required by State and Federal law, the area would later revert to agricultural use. Impacts to land use would be short-term, up to 10 years in duration. No significant impacts are anticipated. Impacts are limited to the site itself because the mining of federal coal would create no surge of demand for housing, shopping opportunities or other human needs.

RECREATION

Habitat destruction and the resulting loss of wildlife species (deer, upland game birds, waterfowl) will damage recreational hunting. From the recreation perspective, it is likely the loss will be manageable.

Social and economic studies have documented demographic changes, resulting from mining that will stress communities in the vicinity of the tract. This stress will be felt on the available recreation facilities in the communities. Outside of the communities, increased pressure will be seen on private and public land because of recreational opportunities lost to mining.

AESTHETICS

Coal mining is a visible part of the landscape as it now exists and views of this type of activity should be within the expectations of those traveling through the area. The impact of unnatural land forms and large scale operations should thus surprise no one, diminishing the effect of additional coal mining in the region. Whereas, mining does not display a particularly attractive aesthetic surface, the characteristics of mining form part of the character of the landscape, minimizing its perceived adverse value. The reduction of visual amenity depends primarily upon the quality of the design of the mine itself related to the location from which it is seen. These views of the coal operation at Glenharold would be of short duration under the worst of conditions and under the best conditions of reclamation the impact to the visual surface would be insignificant. The loss of amenity would be restricted to short periods of time and to the area of active mining.

The most visible features would be spoil piles, topsoil stock piles, heavy equipment, buildings and other structures, and the smoke and dust associated with active mining. Of these, smoke and dust are the most undesirable from a visual standpoint. Because coal mining is a part of the character of the region, other features of mining need not seriously impair the visual surface of the area from normal observer positions.

Operations within the Glenharold tract are subservient to the presence of a power plant to the north of alternate State Highway 200. Favorable land forms screen the area except in the northwest portion of the tract as seen from the north. This area would be highly visible and may be considered a loss of amenity during active mining until the area is reclaimed.

WILDLIFE

The Missouri River Breaks constitute some of the most valuable and fragile wildlife habitat of all areas in west-central North Dakota where coal strip mining is occurring or is proposed. The dissected topography with its high density of native woodlands and native prairie is an irreplaceable environment. It cumulatively provides for the highest wildlife diversity and populations. The composite habitat elements provide for 31 wildlife species and many other more common wildlife. Farmland provides no essential habitat for wildlife, although it is used by numerous wildlife throughout the year.

Onsite effects to wildlife resources would be degradation and possible loss of the three essential habitats. Off-site aquatic habitats in the Missouri and Knife River would be recipients of potential point and non-point pollution. The effects on the riverine aquatic systems and wildlife populations would be immediate and long-term if mine leachates and other pollutants are permitted to drain from the existing and proposed mine areas.

There would be a significant area loss to wildlife resources if strip mining occurs in the essential wetlands, woodlands, and native prairie.

Mobile wildlife such as birds and large mammals may shift about the habitat losses to some degree, but non-mobile species such as reptiles and amphibians would be destroyed. The very limited availability and disruption of riparian woodlands and wetlands would restrict,

and in many cases exclude, the accommodation of disturbed mobile wildlife.

Noise, presence of humans, heavy equipment, dust and affiliated disturbances cumulatively may cause wildlife to vacate unmined habitats and may preclude adoption by wildlife of those rehabilitated areas until the disturbances are eliminated. This may be for the life of the mine and rehabilitation period, which may be as long as 20 or more years.

Increased human populations, resultant of mine development and operations, generally reduce wildlife populations and habitat locally and off-site by poaching, road kills, increased legal harvest, disturbance of reproductive and migratory periods and habitats, harassment by recreationists, feral and uncontrolled cats and dogs, and degradation and complete loss of habitat due to housing, shopping, waste treatment, services, and similiar urban development. The problem is compounded in areas where shift changes of workers coincide with feeding periods, especially big game. The same would probably occur in this area.

Actions to mitigate these impacts available to entities other than BLM, would be to provide mass transportation of workers and adjust the times of shift changes which would greatly reduce poaching. This has been used successfully in other mining areas. Providing funds for the North Dakota Game and Fish Department for increased law enforcement or adoption of a poaching clause in union contracts would also help.

Successful reclamation of native woodlands, and natural wetlands such as "potholes" and riverine wetlands, has not been demonstrated. Successful reclamation of native prairie in North Dakota has yet to be fully demonstrated, although some prairie plowed about 70 years ago, and since left undisturbed, shows some evidence of native plant species reestablishment.

Concurrent reclamation of lost wildlife habitat within 12 to 18 months after mining may reduce a few of the less negative wildlife impacts. However, disruption or loss of any of the larger wetlands and riparian woodlands might be a permanent loss.

At present there is no data to demonstrate that natural, biologically viable wetlands of North Dakota (e.g., potholes) can be reclaimed. It would be most productive and conservative to eliminate mining from the larger wetlands (e.g., 1/2 acre and greater), thereby retaining the critical soils structure of the wetlands and eliminating the extended delay proposed for wetlands re-creation attempts. Destruction of natural viable wetlands by strip mining under the present state of biological and hydrological knowledge would be an irretrievable commitment of wildlife resources.

An interagency team of wildlife biologists from the North Dakota Game and Fish Department, U.S. Fish and Wildlife Service and Bureau of Land Management has identified and recommended areas for the application of unsuitability criteria (Map 3). Formal recommendations have been received by BLM from the other agencies. Joint agreement among the agencies and final decisions on unsuitability, exemptions such as producing leases, and exceptions will be completed in August.

CULTURAL RESOURCES

All cultural resources within the tract boundaries are subject to direct and indirect impacts. Direct impacts are those that result from ground disturbance activities and can result in damage and destruction to sites, artifacts, their environmental context and the data they contain.

Sites not directly impacted by earth disturbance may receive secondary impacts such as vandalism and loss as a result of erosion.

Lease stipulations to treat both recorded and unrecorded sites would require management plans for cultural resources and detailed mitigation plans.

ECONOMIC AND SOCIAL CONDITIONS

It is unlikely that the employment level of the mine would significantly change if the Glenharold tract is leased. Without a change in mine employment, the population level of the surrounding communities would remain stable. This would result in no additional impacts to community services or changes in social conditions.

The only effect of leasing on community services would be a continuation of the existing level of demand for these services for an additional 40 years (life of the mine). The present condition of public services in communities where existing mine employees reside was shown in Figure 2.

Technical reports are available which discuss the methodology used in the economic or social analysis.

NET ENERGY ANALYSIS

A net energy analysis was calculated using the guidance contained in BLM Washington Office Information Memo 80-640, July 17, 1980. Approximately 37.7 British thermal units (Btus) would be expended to produce a pound of coal. That pound of coal, in turn, would produce about 6,788 Btus. The ratio of energy produced to that expended is 180.0 Btus/1 Btu.

CLIMATE AND AIR QUALITY

Impacts on climate from the proposed action cannot be addressed specifically. This is due to a lack of technical information and research work on the topic of potential impacts on climate. However, general climatic influences applicable to the proposed development can be discussed.

The modification of surface contours and albedo due to redistribution of soils and removal of vegetation may produce slight localized changes in wind speed and direction, temperature, and humidity. Impacts associated with the increased particulate emissions could also alter local climatic conditions. Reclamation with reestablishment of vegetation and a stable landscape should largely mitigate these impacts over the long-term.

The methodology for determining the air quality impact of particulate emissions consists of: 1) obtaining mine profiles for the tract from the Bureau of Land Management (BLM); 2) obtaining emission factors for individual surface coal mining operations; 3) using the mine profile and emission factors for calculation of total emissions; 4) entering the emission data into a modified climatological dispersion model (CDMQC) for prediction of ambient concentrations; and 5) comparing predicted concentrations to Federal and State Ambient Air Quality Standards and to Prevention of Significant Deterioration (PSD) increments. The air quality impact was analyzed for the proposed tract's peak production period.

Details about the CDMQC model, emission factors, and their application appear in the technical report (separate cover).

The results of the modeling analysis were plotted on an isopleth map. The predicted concentrations were then compared with applicable air quality standards. The 1970 Clean Air Act Amendments establish primary and secondary National Ambient Air Quality Standards (NAAQS). North Dakota established air quality standards in 1969. The present Federal and State ambient air quality standards are shown in Table 9.

All pollutant sources must be evaluated to determine if PSD regulations apply. Preliminary evaluations indicate that the proposed coal mine's product emissions (coal dust) would be less than 250 tons/year; therefore, the coal mine is not a PSD source. However, the State PSD regulations specify that if the fugitive dust emissions cause the total potential particulate emissions to be in excess of 250 tons/year, then the source consumes PSD increment (i.e., these sources do not have to meet PSD regulations, but, the emissions from these sources are counted against PSD increment). Table 10 shows Federal and State PSD standards.

During peak production of the mine an estimated 1,678 tons per year would be emitted, with the best available control technology applied. Fugitive dust sources would account for 97 percent of the peak production emissions.

Dispersion modeling was performed to predict particulate concentrations for comparison with State and National Ambient Air Quality Standards. Areas within the active mining area, such as the mine facilities, pit area, and reclamation areas, are not subject to these standards.

The isopleth lines on Figure 4 indicate annual average particulate concentrations that could result during peak production; the highest concentration at a location off the mine site could be 10.4 ug/m^3. This level would consume the allowable Class II PSD annual increment for particulates. With the annual background concentration added (22 ug/m^3), the ambient level should not exceed State or Federal Ambient Air Quality Standards.

In addition to the annual particulate standard of 60 ug/m^3, North Dakota has a 24-hour standard of 150 ug/m^3 that cannot be exceeded more than once per year off the mine site. Figure 5 shows the predicted highest particulate concentrations for 24-hour averaging times, resulting from the proposed action. The predicted highest 24-hour values associated with the proposed action during peak production could be as high as 63 ug/m^3. This level would consume the allowable Class II PSD 24-hour increment for particulates. With the estimated 24-hour background concentration added (100 ug/m^3), the ambient level would be 163 ug/m^3. This level exceeds the State Ambient Air Quality Standard and the Federal Secondary Ambient Air Quality Standard. A violation would occur if the ambient air standard was exceeded more than once per year. There is a possibility that the proposed action could violate State and Federal ambient TSP standards, but this is subject to the mine emissions and the corresponding background levels in the area.

Because the proposed action totally consumes the allowable Class II PSD increments for particulates, any associated PSD source could not contribute significantly (1 ug/m^3-annual; 5 ug/m^3-24-hour) to the PSD's Class II annual or 24-hour particulates increment.

Several small sources of gaseous pollutants are associated with surface coal mining operations.

During peak production, the relatively small gaseous emissions associated with the mining operations are not expected to violate air quality standards. Gaseous emissions for mining sources were not modeled because of their expected limited impacts to the air quality.

TABLE 9
COMPARISON OF AMBIENT STANDARDS
FEDERAL VS. NORTH DAKOTA

	Federal Ambient Air Quality Standards (UPA)			North Dakota Ambient Air Quality Standards	
Pollutant	Wording of Standard	Secondary Standard	Primary Standard	Primary Standard	Wording of Standard
TOTAL SUSPENDED PARTICULATES	Annual geo. mean conc.	60 ug/m^3	75 ug/m^3	60 ug/m^3	Annual geo. mean conc.
	Max. 24-hr. concentration not to be exceeded more than once per year	150 ug/m^3	260 ug/m^3	250 ug/m^3	Max. 24-hr. conc. not to be exceeded more than once per year
SETTLED PARTICULATES (Dustfall)	(At present there is no federal standard)			15 tons/ sq. mile	Max. 3-month arithmetic mean in residential areas
				30 tons/ sq. mile	Max. 3-month arithmetic mean in heavy industrial areas
COEFFICIENT OF HAZE	(At present there is no federal standard)			0.4 coh. per 1000 linear ft.	Max. annual geo. mean
SULFUR DIOXIDE	Annual arith. avg. conc.		.03 ppm (80 ug/m^3)	60 ug/m^3 (0.02 ppm)	Max. annual arithmetic mean
	Max. 24-hr. concentration not to be exceeded more than once per year		.14 ppm (365 ug/m^3)	260 ug/m^3 (0.10 ppm)	Max. 24-hr. conc.
	Max. 3-hr. concentration not to be exceeded more than once per year	.50 ppm (1300 ug/m^3)		715 ug/m^3 (0.24 ppm)	Max. 1-hr. concentration
REACTIVE SULFUR (Sulfation)	(At present there is no federal standard)			0.24 mg SO_3/100 cm^2/day	Max. annual arithmetic mean
				0.50 mg SO_3/100 cm^2/day	Max. for a 1-month period
SUSPENDED SULFATE	(At present there is no federal standard)			4 ug/m^3	Max. annual arithmetic
				12 ug/m^3	Max. 24-hr. conc. not to be exceeded over 1 percent of the time
SULFURIC ACID MIST, SULFUR TRIOXIDE OR ANY COMBINATION THEREOF	(At present there is no federal standard)			4 ug/m^3	Max. annual arithmetic mean
				12 ug/m^3	Max. 24-hr. conc. not to be exceeded over 1 percent of the time
				30 ug/m^3	Max. 1-hr. concentration not to be exceeded over 1 percent of the time

TABLE 9 (cont.)
COMPARISON OF AMBIENT STANDARDS
FEDERAL VS. NORTH DAKOTA

	Federal Ambient Air Quality Standards (UPA)			North Dakota Ambient Air Quality Standards	
Pollutant	Wording of Standard	Secondary Standard	Primary Standard	Primary Standard	Wording of Standard
HYDROGEN SULFIDE	(At present there is no federal standard)			45 ug/m^3 (0.032 ppm)	Max. ½-hr. conc. not to be exceeded more than twice in any 5 consecutive days.
				75 ug/m^3 (0.054 ppm)	Max. ½-hr. conc. not to be exceeded over twice a year
CARBON MONOXIDE	Max. 3-hr. concentration not to be exceeded more than once per year	9 ppm (10 ug/m^3)	9 ppm (10 ug/m^3)	10 ug/m^3 (9 ppm)	Max. 3-hr. conc. not to be exceeded more than once per year
	Max. 1-hr. concentration not to be exceeded more than once per year	35 ppm (40 ug/m^3)	35 ppm (40 ug/m^3)	40 ug/m^3 (35 ppm)	Max. 1-hr. conc. not to be exceeded more than once per year
OZONE	Max. 1-hr. concentration not to be exceeded more than once per year	0.12 ppm (235 ug/m^3)	0.12 ppm (235 ug/m^3)	235 ug/m^3 (0.12 ppm)	Max. 1-hr. conc. not to be exceeded more than once per year
HYDROCARBONS (Less Meth.)	Max. 3-hr. concentration (6-9 a.m.) not to be exceeded more than once per year	.24 ppm (160 ug/m^3)	.24 ppm (160 ug/m^3)	160 ug/m^3 (0.24 ppm)	Max. 3-hr. conc. (6-9 a.m.) not to be exceeded more than once per year
NITROGEN DIOXIDE	Annual arithmetic avg. concentration	.05 ppm (100 ug/m^3)	.05 ppm (100 ug/m^3)	100 ug/m^3 (0.05 ppm)	Max. annual arithmetic mean
				200 ug/m^3 (0.10 ppm)	Max. 1-hr. conc. not to be exceeded over 1 percent of the time in any 3-month period
LEAD	Quarterly arithmetic mean		1.5 ug/m^3	1.5 ug/m^3	Quarterly arithmetic mean

Sources:

National Ambient Air Quality Standards. 1978.
North Dakota Air Pollution Regulations. 1978.

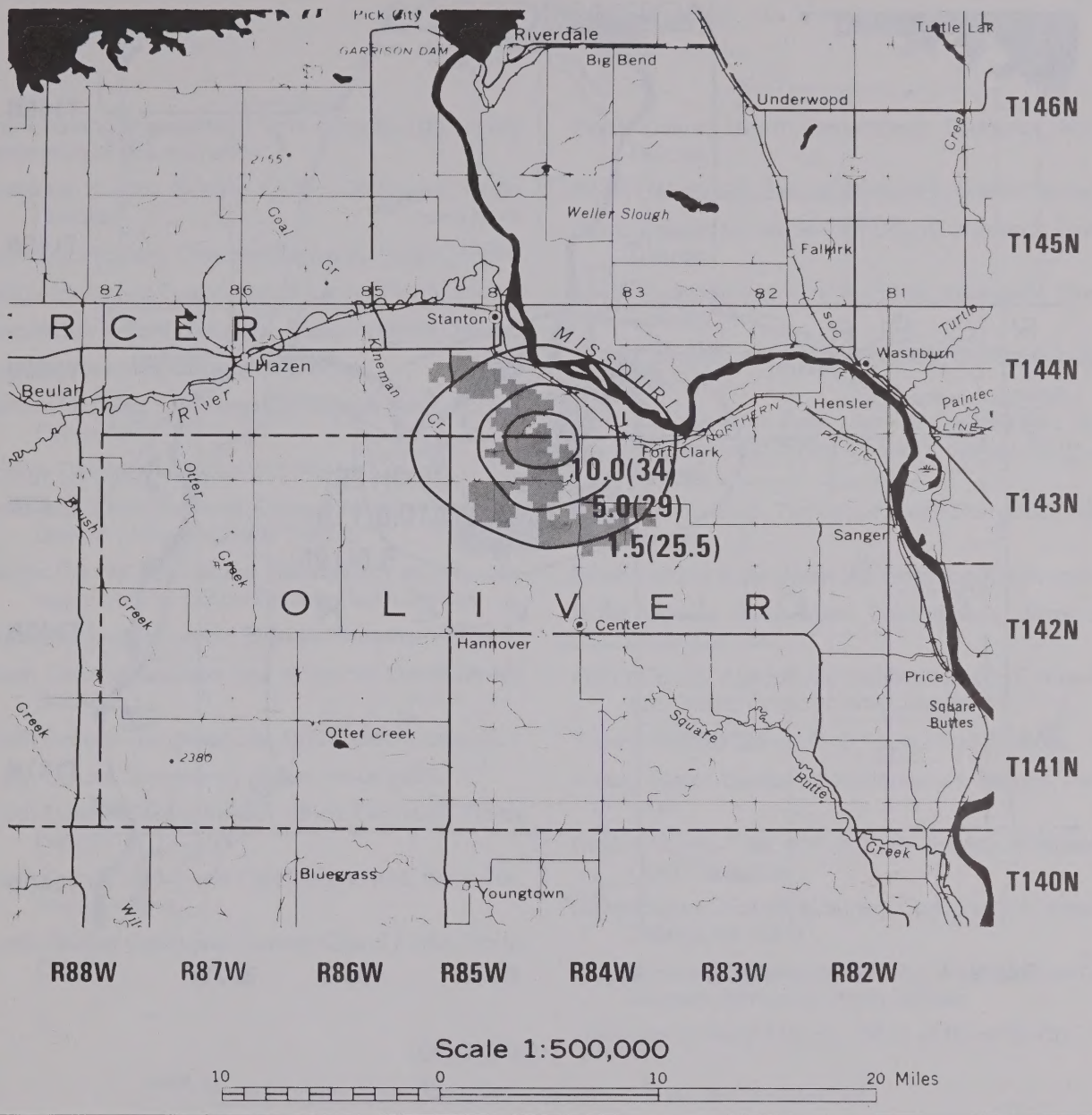
TABLE 10
FEDERAL AND STATE PSD STANDARDS

	Federal	State
Major Sources, subject to PSD review	100[1]	100[3]
(excludes fugitive dust emissions) (t/yr)	250[2]	250[4]
Major Sources, not subject to PSD review-counts against PSD increment	100[1]	100[3]
(considers fugitive dust emissions) (t/yr)	250[2]	250[4]
Deterioration Increments for Area Designations		
Particulates		
Class I		
annual geometric mean (ug/m^3)	5	5
24-hour maximum (ug/m^3)	10	10
Class II		
annual geometric mean (ug/m^3)	19	10
24-hour maximum (ug/m^3)	37	30
Class III		
annual geometric mean (ug/m^3)	37	37
24-hour maximum (ug/m^3)	75	75
Sulfur Dioxide		
Class I		
annual arithmetic mean (ug/m^3)	2	2
24-hour maximum (ug/m^3)	5	5
3-hour maximum (ug/m^3)	25	25
Class II		
annual arithmetic mean (ug/m^3)	20	15
24-hour maximum (ug/m^3)	91	91
3-hour maximum (ug/m^3)	512	512
Class III		
annual arithmetic mean (ug/m^3)	40	40
24-hour maximum (ug/m^3)	182	182
3-hour maximum (ug/m^3)	700	700

1. Listed sources; CFR Chapter 51:24
2. All other sources (includes coal mines); CFR Chapter 51:24
3. Listed sources; N.D.A.C. Chapter 33-15-15
4. All other sources (includes coal mines); N.D.A.C. Chapter 33-15-15

*SOURCES

Prevention of Significant Deterioration of Air Quality. 1978. Chapter 33-15-15 NDAC Requirement for Preparation, Adaption and Submittal of Implementation Plan. 1978. Title 40 CFR, Part 51.

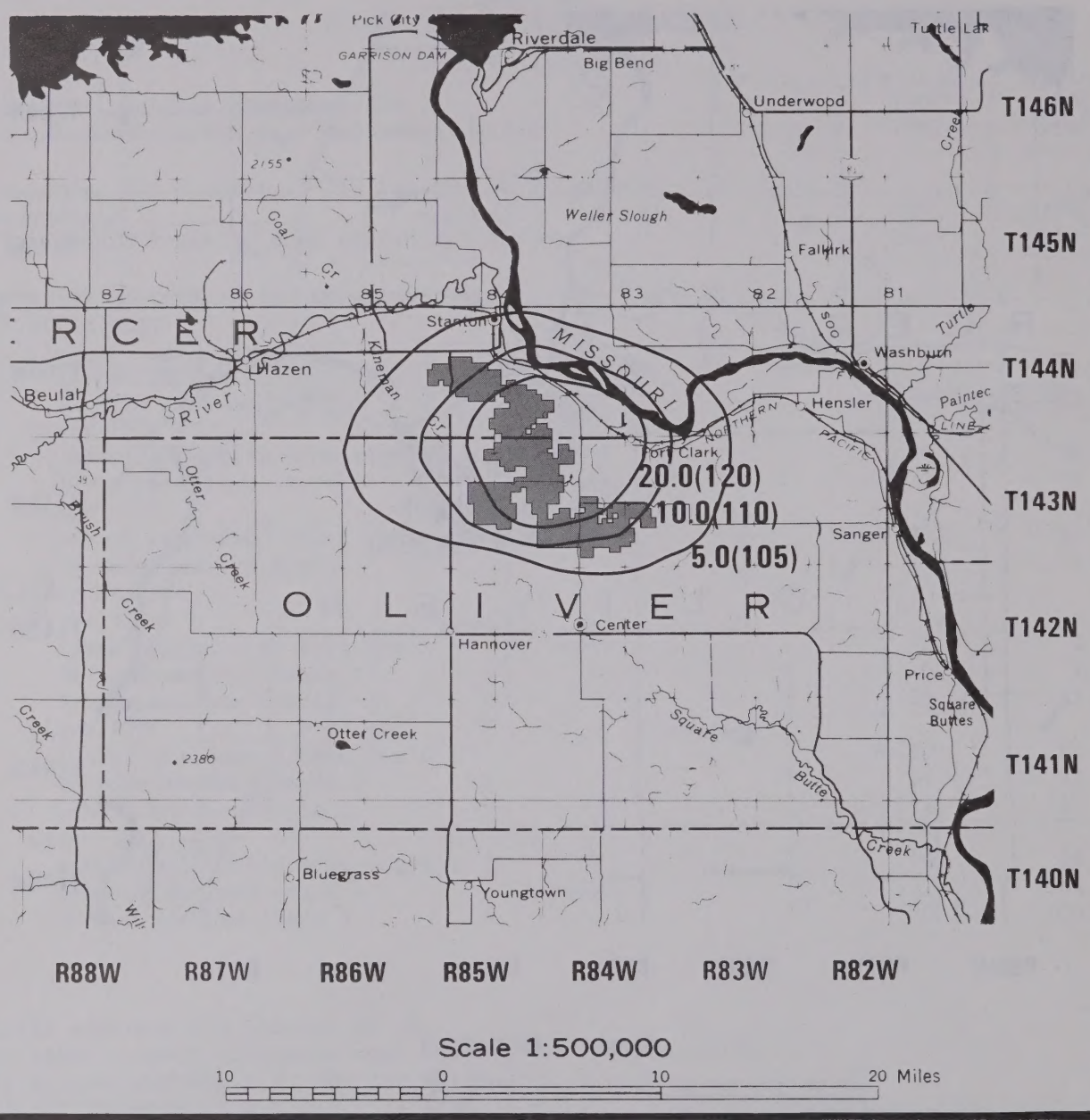


Glenharold Tract

TSP Annual Average Concentration (ug/m^3) Isopleths

Note: Number in parenthesis indicates predicted concentration plus background concentration.

FIGURE 4



Glenharold Tract

TSP Maximum 24-hour Concentration (ug/m^3) Isopleths

-N-

Note: Number in parenthesis indicates predicted concentration plus background concentration.

FIGURE 5

CHAPTER IV
CONSULTATION AND COORDINATION

The following organizations were consulted during the production of this document.

Badlands Human Service Center; Dickinson, North Dakota.

Bismarck Planning Director; Bismarck, North Dakota.

Center Mayor and Town Council; Center, North Dakota.

Consolidation Coal Company; Stanton, North Dakota.

Cumin Associates; Billings, Montana.

Eastern Montana Social and Community Services Task Force.

Energy Development Board of Mercer County.

Lewis and Clark Regional Council Mandan Planning Director; Mandan, North Dakota.

Mercer County Agricultural, Stabilization and Conservation Service Office; Beulah, North Dakota.

Mountain West Research; Billings, Montana.

North Dakota Business and Industrial Development Board.

North Dakota Combined Law Enforcement Council.

North Dakota Community Action Association.

North Dakota Energy Impact Office; Bismarck, North Dakota.

North Dakota Game and Fish Department; Bismarck, North Dakota.

North Dakota Geological Survey; Grand Forks, North Dakota.

North Dakota Health Department; Bismarck, North Dakota.

North Dakota Job Service; Bismarck, North Dakota.

North Dakota Social Service Board; Bismarck, North Dakota.

North Dakota State Fire Marshall; Bismarck, North Dakota.

North Dakota State Historical Society; Bismarck, North Dakota.

North Dakota State Public Service Commission, Reclamation and Siting Division; Bismarck, North Dakota.

North Dakota State Tax Department; Bismarck, North Dakota.

North Dakota State University, Sociology Department.

North Dakota State Water Commission; Bismarck, North Dakota.

Oliver County Agricultural Stabilization and Conservation Office; Center, North Dakota.

Three Affiliated Tribes; New Town, North Dakota.

United States Bureau of Reclamation; Billings, Montana.

United States Fish and Wildlife Service, Bismarck, North Dakota.

United States Geological Survey, Conservation Divsion; Billings, Montana.

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SUMMARY MATRIX
GLENHAROLD TRACT
RESOURCE AND ENVIRONMENTAL CONSIDERATION

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Topography	Hilly	Less contrasting topography with slight modification of drainage patterns	Low	Good	
Geology and Minerals					
Geologic Hazards	None Identified	None	N/A	Good	
Potential for Other Minerals	Low - This tract is in the Williston Basin (oil and gas).	Low - There has been exploratin activity in the area.	Mining could interfere with later oil development.	Good	
Paleontological Resources	Low - None identified to date.	Will improve knowledge of resource near the mine.	Low	Good	
Soils and Reclamation Potential					
Soil Erosion Potention	Wind - mod Water - mod to high	Increase with soil handling operations but little overall change.	Minimal	Outstanding	
Toxic Elements in Soil	No problems	None	None	There has not been a need for this data.	
Chemicals Corrosive to Metal or Concrete in Soil	Corrosivity of most soils to: Untreated steel - High; Concrete - Low.	None	None	Outstanding	

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Highly Saline/Sodic Soil Conditions	There are about 500 acres of saline/sodic soils scattered through the area.	These soils can possibly be improved by replacing with better plant growth material from surrounding soils and/or the overburden.	Minimal - possible slight increase in productivity.	Outstanding	
Character of Subsurface Materials and/or Interburden	Overburden composed of shale, siltstone, and sandstone. A thin mantle of glacial till covers the residual material on some uplands. Physical and chemical data from core drill holes tested for Glenharold Mine within this tract indicates that in some areas a portion of the top 25 to 50 feet of overburden is suitable for reconstructing soil profiles. The deeper material has problems such as high sodium and clay content.	Some instability problems (settling, piping) may appear primarily during the first 3 years from the onset of reclamation.	Minimal	Outstanding	
		Some of the overburden could be used to improve areas with soils rated "poor" for final cover of surface mined land. It could also supplement soils for areas where the amount of soil saved for reclamation work was limited by steep slopes.	Possible slight increase in productivity of some areas.		
Reclamation Potential					
	Based on the soil suitability for final cover of surface mined land, the chance for successful reclamation of individual landowner holdings and for the portion of the tract covered by this analysis as a whole appears to be quite good. However, the extensive steep slopes with numerous woody draws will make soil removal, mining, and reclamation difficult and expensive.			Outstanding	
	The breakdown of soil suitability totals from Table 2 are as follows: "Good" - 4,765 acres, 47%; "Fair" - 4,565 acres, 45%; and "Poor" - 750 acres, 8%.				
	Precipitation could be a limiting factor for reestablishing vegetative cover some years.				

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Hydrology					
Drawdown of of Shallow Groundwater Levels	Many wells in and surrounding the tract rely on shallow groundwater for domestic and livestock supplies.	Wells finished in the mine disturbance zone near an open pit will have lowered water levels during mining.	Will affect between 14 and 35 wells used for domestic and livestock purposes.	Hydrology - Good Well Inventory - Acceptable	This will be a short-term impact that will only occur to a few wells at a time as mining progresses through the tract.
Degradation of Groundwater Quality	Lignite water does not meet Public Health Service drinking water quality standards. It is acceptable for domestic and stockwater purposes since it is the best practical source.	Groundwater quality will be degraded in the tract and this impact can move down gradient into the surrounding unmined aquifers.	Will affect between 4 and 10 wells used for domestic and livestock purposes.	Hydrology - Good Well Inventory - Acceptable Impact Prediction - Acceptable	The long-term impact of how far down gradient poor water quality will move is not known.
Vegetation					
Cropland	There are 1759 acres of land in the tract that are currently being cropped.	Average annual loss of 33 acres excluding 255 total acres of summer fallow. Annual production on this 33 acres would be 832 bu. of wheat. Maximum loss in any one peak mining year would be 334 acres and 8417 bu. of wheat.	Moderate to high depending upon individual operation. Low to moderate for overall production.	Good	
Rangeland	Average annual production is 4535 AUMs.	Average annual loss of 87 AUMs. Each acre would be out of production from 10 to 15 years. Maximum loss for any one peak mining year would be 1723 acres and 861 AUMs.	Moderate to high depending upon individual operation. Low to moderate for overall tract.	Good	

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Agriculture	There are 26 operators in the tract.	The same number of operators will be affected, to varying degrees, by a long-term but temporary loss of acreage for agricultural production.	Very significant to the operators involved.	Outstanding	
	31% of the involved operators' acreage is in the tract.			Outstanding	
	31% of the acreage in the tract is operated by lessees.	Nonowners will lose the use of their leased acreage with no compensation.	Significant to non-owners.	Outstanding	
Threatened or Endangered Species	There are no threatened or endangered species (on the Federal List) in the tract.	None	None	Good	
Land Use	Agriculture Coal Mining	Existing agricultural use would be displaced in the short term.	See Vegetation and Agriculture Section.	Acceptable	
	Minor roads and local utilities	Roads and utilities either relocated or bypassed	Minor inconvenience.		
Recreation Values	Less than 5% of tract used for recreation.	Loss of recreational areas and added stress on available recreational opportunities.	Limited recreational opportunities make impacts significant.	Good - Based on current studies.	
Aesthetics	Agriculture, dynamic. The area includes unreclaimed coal mining area. Moderate aesthetic quality but low scenic value.	Short term deterioration of aesthetic quality.	Insignificant	Acceptable	
	Power plant dominates, distracting from mine activity from State Highway 200.	No effect to scenic quality or aesthetic quality in the long term.			

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Wildlife					
Sensitive Wildlife and Essential Habitats	Essential habitat for sensitive wildlife ranges from 63-80% of the areas for about 30 species. Whooping crane and northern swift fox are identified with the the area.	Coal mining and attendant actions would severely disrupt and destroy locally significant wetlands and woodlands interspersed with native prairie which singly and in composite constitute the essential habitats for 30 sensitive wildlife and many more common wildlife. Offsite aquatic habitats of Hagel and Square Butte Creeks, Missouri River would be recipients of potential point and non-point pollution.	There would be a significant area loss to wildlife resources if strip mining occurs in the essential wetland, woodlands and native prairie.	1980 CIR aerial photo interpretation by Fish & Wildlife Service, Western Energy and Land Use Team. Unsuitability Criteria Application Team (FWS, NDGP & BLM biologists). Wildlife data quality is high.	To date there are no data to direct succussful recreation (compensation) native woodlands and wetlands after strip mining in this country. Native prairie comprised of native plant species has not been recreated from mine spoil. If some form of habitat replacement is achieved during mining and thereafter, then the negative impacts to wildlife resources would be proportional to the successful compensation.
General	-----	-----	-----	-----	Increased poaching and disturbance would significantly reduce all wildlife populations in the region. If not controlled it would significantly reduce recreation opportunities
Cultural/ Historical Values	Specific data reveals important cultural resources that must be avoided in mining process.	Loss of sites as a result of mining activity.	Irreplaceable loss of important scientific information.	Good	

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Net Energy Analysis	The Glenharold Mine pro-produced 3.48 million tons of coal from this tract in 1980	42.3 million tons of federal coal will be made available for leasing	Production: 6788 BTU/lb. of coal. Consumption: 37.7 BTU/lb. of coal Ratio of production to to consumption: 180:1		
Climate and Air Quality	Good	Possibility that proposed action could violate State and Federal ambient TSP standards. Totally consumes the allowable class II PSD increment for particulates.	Significant	Fair	Any associated PSD source could not contribute significantly ($1ug/m^3$ - annual; $5ug/m^3$ - 24-hour) to the PSD's class II annual or 24-hour particulat increment.
		Social and Economic Consideration			
Employment	Community services generally adequate for current employment site.	Very small if any increase in employment.	Insignificant	Acceptable	
Population	Community services generally adequate for current population.	Very small if any increase in population.	Insignificant	Acceptable	
Regional Income	$4560 estimated regional income per capita.	Very small if any increase in regional income per capita.	Insignificant	Acceptable	
Infrastructure Assessment	Most community services generally adequate; often with one or two inadequate services.	No change in community service adequacy.	Insignificant	Acceptable	

GLENHAROLD TRACT
UNSUITABILITY CRITERIA RESULTS

Criterion	Applicable to Tract	Exception Used (if applicable)	Additional Data Needed	Comments
1. Federal land systems	NO	---	NO	---
2. Rights-of-way and easements	NO	---	NO	---
3. Buffer zones	YES	NO	NO	Exceptions may be applied at mining plan stage
4. Wilderness study areas	NO	---	NO	---
5. Scenic areas	NO	---	NO	---
6. Land used for scientific studies	NO	---	NO	---
7. Historic lands and sites	YES	---	NO	High density site areas along upland breaks juncture is unacceptable for mining
8. Natural areas	NO	---	NO	---
9. Federally listed endangered species	Whooping crane and northern swift fox known or believed to use this region.	---	Swift fox data limited	Exclusion of strip mining from wetlands would protect most whooping crane areas.
10. State listed endangered species	NO	---	---	None exist
11. Eagle nests	NO	---	NO	---

Criterion	Applicable to Tract	Exception Used (if applicable)	Additional Data Needed	Comments
12. Eagle roosts and concentration areas	NO	---	NO	---
13. Falcon cliff-nesting sites	NO	---	NO	---
14. Migratory birds	YES	Yes, interagency team applied exceptions as suitable for mining with stipulations	---	Seven species in combination with Criterion 15
15. State resident fish and wildlife	YES	Yes, interagency team applied exceptions as suitable for mining with stipulations	---	About 20 species in combination with Criterion 14
16. Flood plains	NO	---	NO	---
17. Municipal watersheds	NO	---	NO	---
18. National resource waters	NO	---	NO	---
19. Alluvial valley floors	NO	---	NO	---
20. State proposed criteria	NO	---	NO	---

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